Appendix E

AIR QUALITY ANALYSIS REPORT

This page intentionally left blank.

AIR QUALITY ANALYSIS REPORT
The Shell Martinez Marine Terminal Lease Consideration
Martinez, California

Prepared for:

CALIFORNIA STATE LANDS COMMISSION
100 Howe Ave Ste 100-South
Sacramento, CA 95825

Prepared by:

CHAMBERS GROUP, INC.
302 Brookside Avenue
Redlands, California 92373
(909) 335-7068

April 2009
Revised August 2009

EXECUTIVE SUMMARY

This air quality evaluation was prepared in accordance with the requirements of the California Environmental Quality Act (CEQA) to determine if significant air quality impacts are likely to occur in conjunction with the Shell Martinez Marine Terminal Lease (Project).

The California State Lands Commission (CSLC) is considering granting a new 30-year lease of California sovereign lands to Shell, an offshore barge and tanker transfer facility. The lease, if granted, would allow Shell to continue to operate its Shell Martinez Marine Terminal (Terminal). The purpose of this Project is to maintain the Shell Refinery (Refinery) viability by continuing current Terminal operations. Without the use of the Shell Martinez Marine Terminal, the Refinery would not be viable and would be shut down.

The Shell Martinez Marine Terminal is located in the city of Martinez in Contra Costa County, California, on the south shore of the Carquinez Strait, approximately 20 miles northeast of San Francisco and 0.5 mile west of the Benicia-Martinez Bridge (Highway 680). The Carquinez Strait is a narrow channel. For the first 3.5 miles, the strait is less than 0.5 mile wide, and then widens to approximately 1.0 mile.

The Shell Martinez Marine Terminal facility consists of an approximate 28-acre footprint of public land leased from the CSLC as a barge and tanker transfer facility for crude oil and petroleum products. The Shell Martinez Marine Terminal is capable of operating 365 days, 24 hours a day, although actual operation depends on shipping demands. The Shell Martinez Marine Terminal supports the Shell Refinery, located immediately south of the Shell Martinez Marine Terminal on 850 acres of Shell-owned (Upland) property.

The T-shaped Shell Martinez Marine Terminal consists of a 1,950-foot long, average 40-foot wide, concrete wharf connected to shore by a 1,900-foot long, 16-foot wide, elevated wooden approach roadway. A 40-foot-wide pile-supported pipe rack parallels the approach roadway.

The Shell Martinez Marine Terminal has four berths – two berths (#1 and #2) on the outer (north) side, and two berths (#3 and #4) on the inner (south) side – equipped with pumps, pipelines, electrical utilities and other mechanical equipment. The terminal can moor tankers up to 1,000 feet in length at one of the outer berths, while simultaneously mooring a smaller vessel. The inner berths currently are not in use, due to accumulated silt. The Project includes dredging of the silt in order to use all four berths during the proposed lease agreement.

The impact analysis contained in this report was prepared in accordance with the methodologies provided by the Bay Area Air Quality Management District (BAAQMD) in the "BAAQMD CEQA Guidelines Assessing the Air Quality Impacts of Projects and Plans" (*Guidelines 1999*).

The analysis finds that short-term maintenance emissions from dredging activities and long-term operational activities are below Shell's Refinery Emissions Cap permitted limits for criteria pollutants and are therefore less than significant.

In conclusion, the Project represents the operation of the Shell Martinez Marine Terminal. The Project would not involve growth-inducing impacts or cause an exceedance of established population or growth projections. The Project would not create an increase either short- or long-term significant quantities of criteria pollutants. The Project would not result in significant localized air quality impacts. As such, the Project is consistent with the goals of the BAAQMD Clean Air Plan and Ozone Strategy for the Project area and in this respect does not present a significant impact.

In the long term, the mitigation measure stated below will reduce Project-generated GHG emissions thereby reducing the Project's incremental contribution of GHG emissions to less than significant levels.

Mitigation Measures

Greenhouse Gas Mitigation Measures

Mitigation Measure GHG-1: No later than one-year after approval of the issuance of a new lease for the Shell Martinez Marine Terminal and again on or before the five-year anniversary of said approval, Shell shall memorialize their method of compliance with CCR Section 2299.3, Title 13, Chapter 5.1 in a written report to Commission staff. This will include the status of all plans, actions, decisions, or studies by the California Air Resources Board and/or the Bay Area Air Quality Management District with respect to cold ironing or other comparable technology (including the possibility of installing onshore cold ironing or other comparable infrastructure), relating to oil tanker vessels operating at the Shell Martinez Marine Terminal.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF Figures

LIST OF APPENDICES

LIST OF ACRONYMS AND ABBREVIATIONS

1	^{O}F	degrees Fahrenheit
2	µg	microgram
3	µg/m^3	micrograms per cubic meter
4	AAQS	Ambient Air Quality Standards
5	AQMD	Air Quality Management District
6	BAAQMD	Bay Area Air Quality Management District
7	BACT	Best Available Control Technology
8	BARCT	Best Available Retrofit Control Technology
9	Basin	San Francisco Bay Area Air Basin
10	bpd	barrels per day
11	bpy	barrels per year
12	CAA	Federal Clean Air Act
13	CAAQS	California Ambient Air Quality Standards
14	CAP	Bay Area Clean Air Plan
15	CARB	California Air Resources Control Board
16	CARE	Community Air Risk Evaluation
17	CAT	Climate Action Team
18	CCAA	California Clean Air Act
19	CCR	California Code of Regulations
20	CEC	California Energy Commission
21	CEQA	California Environmental Quality Act
22	CF_4	Carbon tetrachloride
23	CFC	Chlorofluorocarbons
24	CH_4	Methane
25	CO	Carbon Monoxide
26	CO_2	Carbon Dioxide
27	CO_2E	Carbon Dioxide Equivalents
28	CSLC	California State Lands Commission
29	DPM	Diesel Particulate Matter
30	Eq	Equivalent
31	EMFAC2007	On-Road Emission Factors published by the CARB in 2007
32	EPA	Environmental Protection Agency
33	gal	gallon
34	GCC	Global Climate Change
35	GHG	Greenhouse Gas
36	gm/hp-hr	grams per horsepower-hour

LIST OF ACRONYMS AND ABBREVIATIONS

1	GWP	Global Warming Potential
2	HC	bydrocarbons
3	HFC	Hydrofluorocarbons
4	hp	horsepower
5	hr	hour
6	IPCC	Intergovernmental Panel on Climate Change
7	lbs	pounds
8	m^3	cubic meters
9	mph	miles per hour
10	MTC	Metropolitan Transportation Commission
11	MVR	Marine Vapor Recovery
12	NAAQS	National Ambient Air Quality Standards
13	NMHC	non-methane hydrocarbons
14	N_2O	Nitrous Oxide
15	NO	Nitrogen Oxide
16	NO_2	Nitrogen Dioxide
17	NO_X	Nitrogen Oxides
18	OAL	Office of Administrative Law
19	O_3	Ozone
20	OPR	Governor's Office of Planning and Research
21	Pb	Lead
22	PM_{10}	Particulate Matter of 10 micrograms or less in size
23	$PM_{2.5}$	Particulate Matter of 2.5 micrograms or less in size
24	POC	Precursor Organic Compound
25	ppb	parts per billion
26	ppm	parts per million
27	REFREMS	Refinery Emissions
28	ROC	Reactive Organic Compounds
29	ROG	Reactive Organic Gases
30	SCAG	Southern California Association of Governments
31	SF_6	Sulfurhexaflouride
32	SIP	State Implementation Plan
33	SO_2	Sulfur Dioxide
34	SO_X	Sulfur Oxides
35	Tg	Teragram
36	USCG	United States Coast Guard

LIST OF ACRONYMS AND ABBREVIATIONS

1	VCS	Vapor Control Systems
2	VOC	Volatile Organic Compound
3	yr	year

SECTION 1.0 – INTRODUCTION

This air quality evaluation was prepared in accordance with the requirements of the California Environmental Quality Act (CEQA) to determine if significant air quality impacts are likely to occur in conjunction with the Shell Martinez Marine Terminal Lease (Project).

The California State Lands Commission (CSLC) is considering granting a new 30-year lease of California sovereign lands to Shell, an offshore barge and tanker transfer facility. The lease, if granted, would allow Shell to continue to operate its Martinez Marine Terminal (Terminal). The purpose of the Project is to maintain the Shell Refinery (Refinery) viability by continuing current Terminal operations. Without the use of the Shell Martinez Marine Terminal, the Refinery would not be viable and would be shut down.

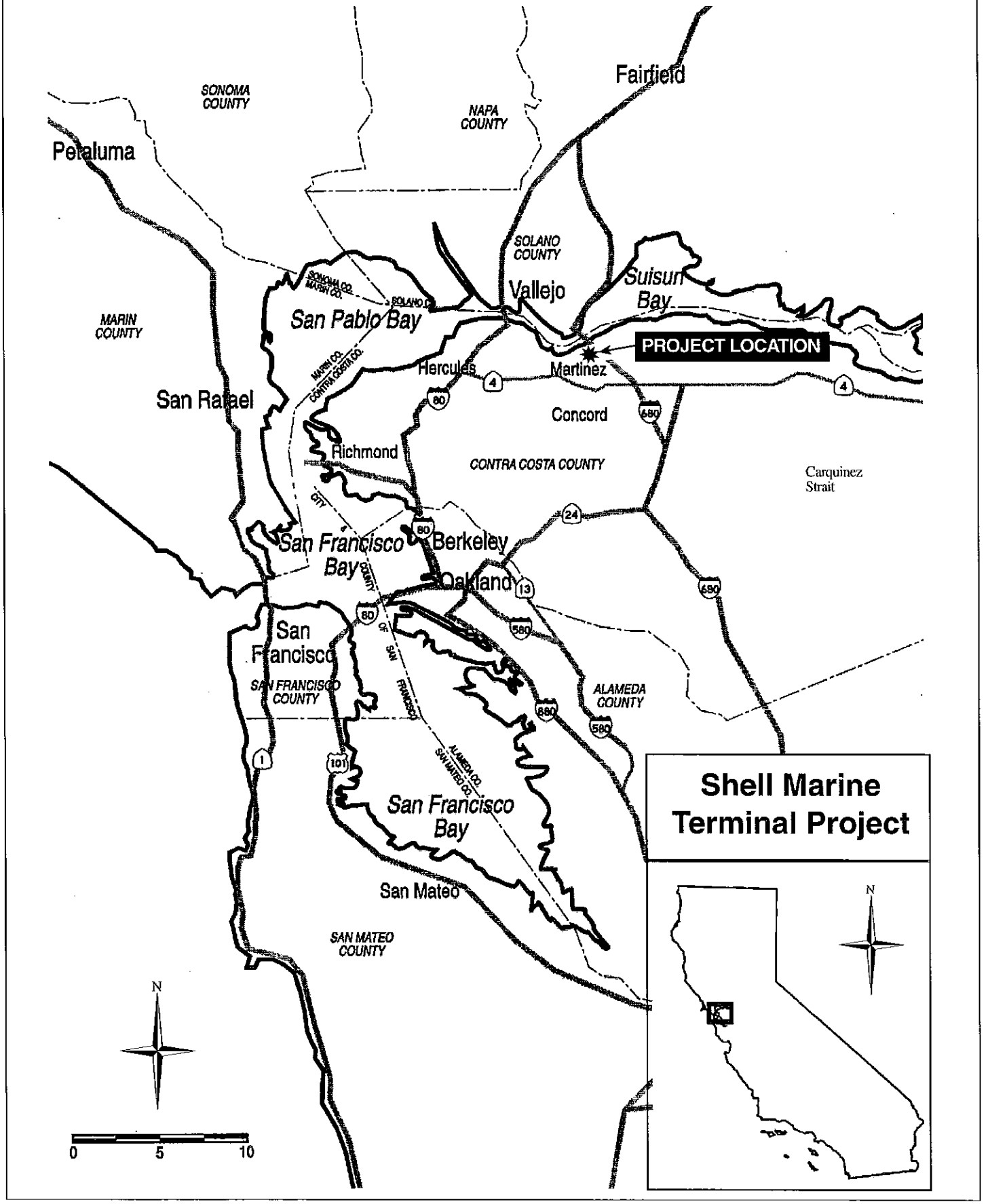
1.1 SITE SETTING

The Shell Martinez Marine Terminal is located in the city of Martinez in Contra Costa County, California, on the south shore of the Carquinez Strait, approximately 20 miles northeast of San Francisco, and 0.5 mile west of the Benicia-Martinez Bridge (Highway 680). The Carquinez Strait is a narrow channel. For the first 3.5 miles, the strait is less than 0.5 mile wide, and then widens to approximately 1.0 mile. Figure 1 shows the location of the Shell Martinez Marine Terminal.

The site is located west of Interstate 680 on the Carquinez Strait, west of the Suisun Bay, in an industrial area of the city of Martinez. The rugged hills of the Franklin Ridge area, located west of the city of Martinez, reach elevations in excess of 900 feet. Topography to the north, across the Carquinez Strait (Carquinez Heights), is also quite hilly. These topographical features, located on either side of the Carquinez Strait, create a high-pressure gradient that causes high wind flows through the Carquinez Strait. Mount Diablo is also a major regional topographic feature with an elevation of over 3,800 feet, located approximately 13 miles to the southeast in Mount Diablo State Park.

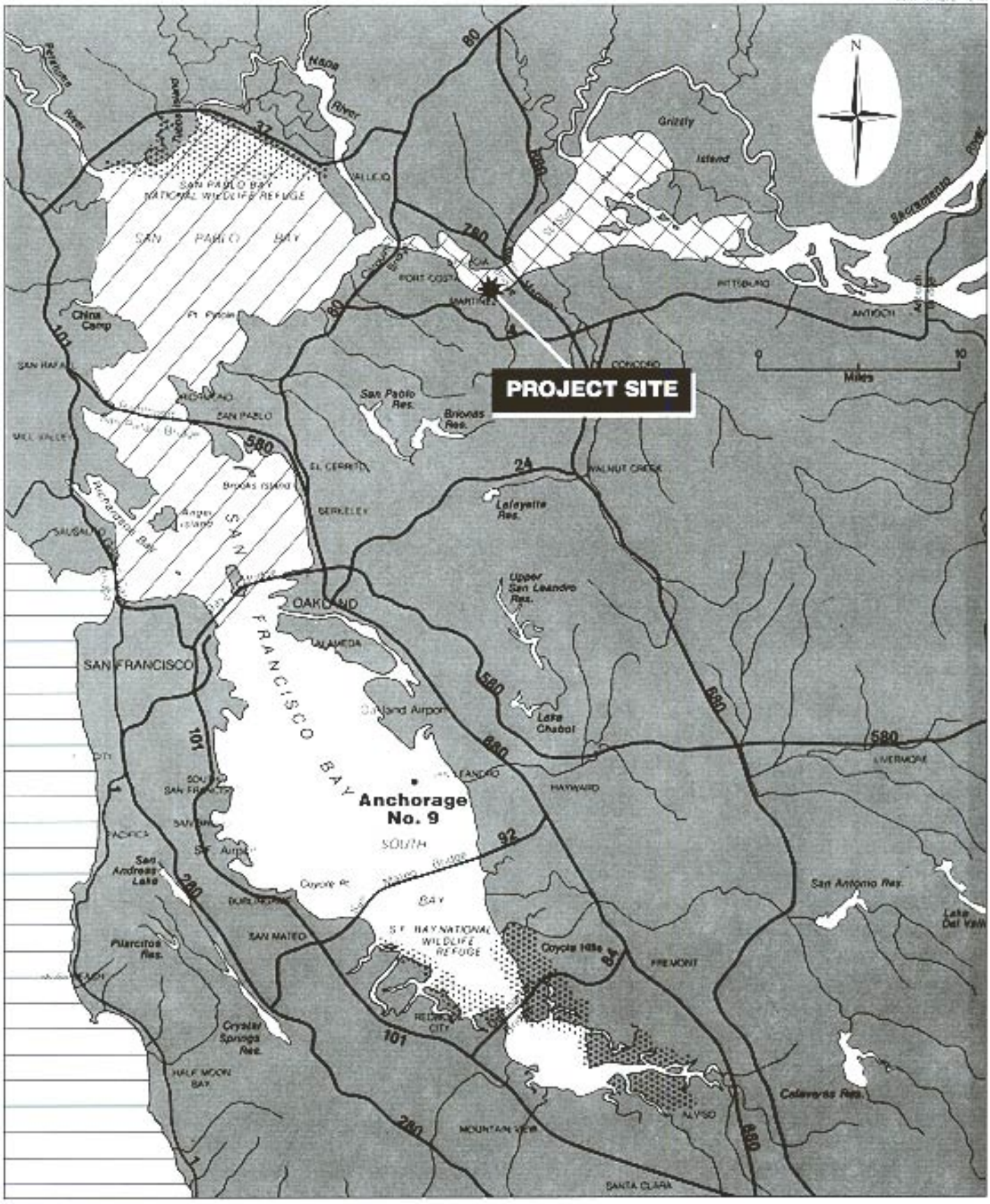
The Shell Martinez Marine Terminal facility consists of an approximate 28-acre footprint of public land leased from the CSLC as a barge and tanker transfer facility for crude oil and petroleum products. The Shell Martinez Marine Terminal is capable of operating 365 days, 24 hours a day, although actual operation depends on shipping demands. The Shell Martinez Marine Terminal supports the Shell Refinery, located immediately south of the Shell Martinez Marine Terminal on 850 acres of Shell-owned (Upland) property.

The T-shaped Shell Martinez Marine Terminal (see Figure 2) consists of a 1,950-foot long, average 40-foot wide, concrete wharf connected to shore by a 1,900-foot long, 16-foot wide, elevated wooden approach roadway. A 40-foot-wide pile-supported pipe rack parallels the approach roadway.



Chambers Group

SHELL MARINE OIL TERMINAL
PROJECT VICINITY MAP
Figure ES-1



MILES
0 10

Source: California Coastal Resource Guide
California Coastal Commission, 1987

LEGEND

- = PRIMARY STUDY AREA
- = SECONDARY STUDY AREA
- = TERTIARY STUDY AREA
- = MUD FLATS

Chambers Group

STUDY AREA
Figure 1.2-1

The Shell Martinez Marine Terminal has four berths – two berths (#1 and #2) on the outer (north) side, and two berths (#3 and #4) on the inner (south) side – equipped with pumps, pipelines, electrical utilities and other mechanical equipment. The Terminal can moor tankers up to 1,000 feet in length at one of the outer berths, while also simultaneously mooring a smaller vessel. The inner berths currently are not in use, due to accumulated silt. The Project includes dredging of the silt below the inner berths in order to enable use of all four berths during the proposed lease agreement.

1.2 CLIMATE AND METEOROLOGY

The climate of the San Francisco Bay Area (Bay Area) is characterized as maritime, where extreme variations in ambient temperatures are rare. The climate is strongly influenced by the proximity of the Pacific Ocean and the irregularities in the inland topography.

During the warmer months, the high pressure system over the Pacific Ocean off the California coast results in negligible precipitation and northwest wind flows over the Bay Area. These northwesterly flows across the Pacific result in ocean surface movement off the California coast and promote the upwelling of cold water near the San Francisco coastline. As cool, moisture-laden air approaches the coast, further cooling occurs as it flows across this cold band. This cooling is often sufficient enough to result in condensation and the formation of fog and clouds in the region during the warmer months.

In winter, when the high pressure system in the Pacific weakens, frequent weather systems are allowed to move inland across northern California. With the formation of a persistent high pressure system over the mountainous regions of northeast California, winter winds in the Bay Area are from the east and northeast.

A majority of the Bay Area's precipitation occurs from November to March. Average annual rainfall for the city of Martinez is 19.6 inches. During this period, inversions are either nonexistent or very weak. Stagnant conditions are rare due to the frequent replacement of air masses with each storm.

Weather patterns influence the dispersion of pollutants. Stagnant periods, which inhibit the dispersion of pollutants in the lower atmosphere, result from abnormally high temperatures and relatively stable conditions. On warmer days when the land-sea temperature differential is high, turbulence results from the passage of westerly winds over the irregular topography, improving the dispersion of pollutants.

1.3 BASELINE ATMOSPHERIC ENVIRONMENTAL CONDITIONS

This section characterizes the baseline atmospheric environment that includes an evaluation of the ambient air quality standards (AAQSs) for the area. Because the Project may release gaseous emissions

of criteria pollutants and fine particulate matter into the ambient air, it falls under the ambient air quality standards promulgated on the local, state, and federal levels.

1.3.1 Criteria Air Pollutants

Federal and state laws regulate the air pollutants emitted into the ambient air by stationary and mobile sources. These regulated air pollutants are known as "criteria air pollutants" and are categorized as primary and secondary pollutants. Primary air pollutants are those that are emitted directly from sources. Carbon monoxide (CO), reactive organic gases (ROG), nitrogen oxides (NO_X), sulfur dioxide (SO_2), and most fine particulate matter (PM_{10}, $PM_{2.5}$) including lead (Pb) and fugitive dust are primary air pollutants. Of these CO, SO_2, PM_{10}, and $PM_{2.5}$ are criteria pollutants. ROG and NO_X are criteria pollutant precursors and go on to form secondary criteria pollutants through chemical and photochemical reaction in the atmosphere. Ozone (O_3) and nitrogen dioxide (NO_2) are the principal secondary pollutants.

Presented below is a description of each of these primary and secondary criteria air pollutants and their known health effects.

Primary Pollutants

Carbon Monoxide (CO) – CO is a colorless, odorless, toxic gas which is produced by incomplete combustion of carbonous substances (e.g., gasoline or diesel fuel). The primary adverse health effect associated with CO is the interference of normal oxygen transfer to the blood which may result in tissue oxygen deprivation (US EPA 1999).

Reactive Organic Gases (ROG) – ROG are compounds comprised primarily of atoms of hydrogen and carbon. Internal combustion associated with motor vehicles is the major source of hydrocarbons. Adverse effects on human health are not caused directly by ROG, but rather by reactions of ROG to form secondary air pollutants, including O_3 (US EPA 1999). Note that for the purposes of this analysis, ROG, reactive organic compounds (ROC), volatile organic compounds (VOC), hydrocarbons (HC), precursor organic compounds (POC), and non-methane hydrocarbons (NMHC), are used synonymously.

Nitrogen Oxides (NO_X) - NO_X serve as integral participants in the process of photochemical smog production. The two major forms of NO_X are nitric oxide (NO) and nitrogen dioxide (NO_2). NO is a colorless, odorless gas formed from atmospheric nitrogen and oxygen when combustion takes place under high temperature and/or high pressure. NO_2 is a reddish-brown irritating gas formed by the combination of NO and oxygen. NO_X acts as an acute respiratory irritant and increases susceptibility to respiratory pathogens (US EPA 1999). NO_X is also an ozone precursor. A precursor is a directly emitted air contaminant that, when released into the atmosphere, forms, causes to be formed, or contributes to the formation of a secondary air contaminant for which an AAQS has been adopted, or whose presence in the atmosphere will contribute to the violation of one or more AAQSs. When NO_X and ROG are

released in the atmosphere, they can chemically react with one another in the presence of sunlight to form ozone.

Sulfur Dioxide (SO_2) – SO_2 is a colorless, pungent, irritating gas formed by the combustion of sulfurous fossil fuels. Fuel combustion is the primary source of SO_2. At sufficiently high concentrations, SO_2 may irritate the upper respiratory tract. At lower concentrations and when combined with particulates, SO_2 may do greater harm by injuring lung tissue (US EPA 1999).

Fine Particulate Matter (PM_{10} and $PM_{2.5}$) – Fine particulate matter consists of finely divided solids or liquids such as soot, dust, aerosols, fumes, and mists. Two forms of fine particulate are now recognized. Course particles, or PM_{10}, include that portion of the particulate matter with an aerodynamic diameter of 10 microns (i.e., ten one-millionths of a meter or 0.0004 inch) or less. Fine particles, or $PM_{2.5}$, have an aerodynamic diameter of 2.5 microns (i.e., 2.5 one-millionths of a meter or 0.0001 inch) or less. Particulate discharge into the atmosphere results primarily from industrial, agricultural, construction, and transportation activities. However, wind action on the arid landscape also contributes substantially to the local particulate loading. Both PM_{10} and $PM_{2.5}$ may adversely affect the human respiratory system, especially in those people who are naturally sensitive or susceptible to breathing problems (US EPA 1999).

Fugitive Dust – Fugitive dust is a form of particulate matter consisting of small airborne particles that do not originate from a specific point. Fugitive dust poses primarily two public health and safety concerns. The first concern is that of respiratory problems attributable to the suspended particulates in the air. The second concern is that of motor vehicle accidents caused by reduced visibility during severe wind conditions. Fugitive dust may also cause significant property damage during strong wind storms by acting as an abrasive material agent (much like sandblasting activities).

Lead (Pb) – Pb in the atmosphere occurs as particulate matter. In the past, the combustion of leaded gasoline was the primary source of lead emissions. Other sources of lead include the manufacturing of batteries, paint, ink, ceramics, and ammunition and secondary lead smelters. With the phase-out of leaded gasoline, secondary lead smelters and battery recycling and manufacturing facilities are becoming lead emission sources of greater concern. Prolonged exposure to atmospheric lead poses a serious threat to human health (US EPA 1999).

Secondary Pollutants

Nitrogen Dioxide (NO_2) – NO_2 is a byproduct of fuel combustion. The principle form of NO_2 produced by combustion is nitric oxide (NO), but NO reacts quickly to form NO_2, creating the mixture of NO and NO_2 commonly called NO_X. NO_2 acts as an acute irritant and, in equal concentrations, is more injurious than NO. At atmospheric concentrations, however, NO_2 is only potentially irritating. There is some indication of a relationship between NO_2 and chronic pulmonary fibrosis. Some increase in bronchitis in children (2 and

3 years old) has also been observed at concentrations below 0.3 parts per million (ppm). NO_2 absorbs blue light, the result of which is a brownish-red cast to the atmosphere and reduced visibility. NO_2 also contributes to the formation of PM_{10}.

Ozone (O_3) – O_3 is one of a number of substances called photochemical oxidants that are formed when reactive organic gases (ROG) and NO_x, both byproducts of the internal combustion engine, react in the presence of ultraviolet sunlight. O_3 is present in relatively high concentrations in the San Francisco Bay Area Air Basin (Basin), and the damaging effects of photochemical smog are generally related to the concentrations of O_3. O_3 may pose its worst health threat to those who already suffer from respiratory diseases. This health problem is particularly acute in sensitive receptors such as the sick, the elderly, and young children. O_3 levels peak during the summer and early fall months (US EPA 1999).

Other Effects of Air Pollution

Just as humans are affected by air pollution, so too are plants and animals. Animals must breathe the same air and are subject to the same types of negative health effects as humans. Certain plants and trees may absorb air pollutants that can stunt their development or cause premature death (US EPA 1999).

There are also numerous impacts to the human economy, including lost workdays due to illness, a desire on the part of businesses to locate in areas with a healthy environment, and increased expenses from medical costs. Pollutants may also lower visibility and cause damage to property. Certain air pollutants are responsible for discoloring painted surfaces, eating away at stones used in buildings, dissolving the mortar that holds bricks together, and cracking tires and other items made from rubber (US EPA 1999).

1.4 AIR MONITORING DATA NEAR THE SHELL MARTINEZ MARINE TERMINAL

The Bay Area Air Quality Management District (BAAQMD) operates a regional air monitoring network for determination of compliance with air quality standards. The network consists of a series of monitoring stations used to measure the ambient concentrations of pollutants for which air quality standards have been established. Each station monitors a combination of gaseous and/or particulate pollutants either on a continuous or every 6-day basis. The data are used to describe the air quality within the surrounding community and to determine the attainment status of the air basin.

The air monitoring station closest to the Project site that monitors ozone, carbon monoxide, nitrogen dioxide, PM_{10} and $PM_{2.5}$ is located in Vallejo on Tuolumne Street in Solano County, almost nine miles to the northwest of the Project site. The Crockett air monitoring station was inoperative after March 27, 2005, due to construction on the site. A three-year summary of the ambient air quality data collected at these stations is presented in Table 1.

Table 1
Summary of Ambient Air Quality Monitoring at the Vallejo Monitoring Station

Pollutant/Standard	Number of Days Thresholds Were Exceeded and Maximum Levels During Such Violations		
	2005	2006	2007
Ozone [1]			
State 1-Hour ≥ 0.09 ppb	0	0	0
Federal 1-Hour > 0.12 ppb [2]	--	--	--
Federal 8-Hour > 0.08 ppb	0	0	0
Max. 1-Hour Conc. (ppb)	0.087	0.080	0.078
Max. 8-Hour Conc. (ppb)	0.070	0.069	0.066
Carbon Monoxide [1]			
State 8-Hour > 9.0 ppm	0	0	0
Federal 8-Hour ≥ 9.5 ppm	0	0	0
Max 1-Hour Conc. (ppm)	3.1	3.7	3.3
Max. 8-Hour Conc. (ppm)	3.9	2.9	2.7
Nitrogen Dioxide [1]			
State 1-Hour ≥ 0.25 ppb	0	0	0
Max. 1-Hour Conc. (ppb)	70	55	58
Max. Annual Conc. (ppb)	11	12	11
Sulfur Dioxide [1]			
Federal 24-Hour ≥ 0.14 ppb	0	0	0
Federal Annual ≥ 0.03 ppb	0	0	0
State 24-Hour ≥ 0.04 ppb	0	0	0
State 1-Hour ≥ 0.25 ppb	0	0	0
Max. 24-Hour Conc. (ppb)	0.005	0.004	0.004
Max. Annual Conc. (ppb)	0.001	0.001	0.001
Source: BAAQMD 2008			

Pollutant/Standard	Number of Days Thresholds Were Exceeded and Maximum Levels During Such Violations		
	2005	2006	2007
Inhalable Particulates (PM_{10}) [1]			
State 24-Hour > 50 µg/m^3	1	0	2
Federal 24-Hour > 150 µg/m^3	0	0	0
Max. 24-Hour Conc. (µg/m^3)	52	50	52
Max. Annual Conc. (µg/m^3)	17.3	19.8	19
Inhalable Particulates ($PM_{2.5}$) [1]			
Federal 24-Hour > 35 µg/m^3	0	2	4
Max. 24-Hour Conc. (µg/m^3)	43.8	42.2	40.8
Max. Annual. (µg/m^3)	9.7	9.8	9.8

1. Data collected taken from the Vallejo Monitoring Station. The Crockett station was inoperative after March 27, 2005, due to construction on site.
2. The federal 1-hour ozone standard was revoked and replaced by the 8-hour ozone standard effective June 15, 2005.

ppm: parts per million; µg/m^3: micrograms per cubic meter; ppb: parts per billion

As indicated in Table 1, the Vallejo monitoring station did not record violations in the state or federal standards for ozone, carbon dioxide, nitrogen dioxide, or sulfur dioxide in the last three years. There were no recorded violations of the National Ambient Air Quality Standards (NAAQS) for PM_{10} during the 3-year sample period at the Vallejo Station, but the State standard was exceeded once in 2005 and twice in 2007. The new federal $PM_{2.5}$ standard was exceeded twice in 2006 and four times in 2007.

1.5 SENSITIVE RECEPTORS

The Project area is located in the San Francisco Bay west of the Benicia-Martinez Bridge. Ships call on the facility dock at the end of the wharf, located about 1,900 feet from the shoreline. No sensitive land uses (such as hospitals, retirement communities, or schools) are located adjacent to the Shell Martinez Marine Terminal. The nearest residential area is approximately 1,750 feet to the south of the Marine Vapor Recovery (MVR) system and 3,900 feet south of the Shell Martinez Marine Terminal berthing area.

SECTION 2.0 – REGULATORY SETTING

2.1 FEDERAL REGULATIONS

The federal Clean Air Act (CAA) required the Environmental Protection Agency (EPA) to identify National Ambient Air Quality Standards (NAAQS) to protect public health and welfare. These standards are the levels of air quality considered safe, with an adequate margin of safety, to protect the public health and welfare. They are designed to protect those "sensitive receptors" most susceptible to further respiratory distress such as asthmatics, the elderly, very young children, people already weakened by other disease or illness, and persons engaged in strenuous work or exercise. Healthy adults can tolerate occasional exposure to air pollutant concentrations considerably above these minimum standards before adverse effects are observed.

NAAQS have been established for the six "criteria" air pollutants including ozone (O_3), carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), fine particulate matter (PM_{10}, $PM_{2.5}$), and lead (Pb), so-called because the standards were based on a health criteria document. The NAAQS are summarized in Table 2.

Air basins, or portions thereof, are classified under the CAA as either "attainment" or "nonattainment" for each criteria air pollutant, based on whether or not the NAAQS have been achieved. The 1990 CAA Amendments gave the EPA new authority to define the boundaries of nonattainment areas. O_3 nonattainment areas have been categorized as "severe," "serious," "moderate," or "marginal." The CO and PM_{10} nonattainment regions have been divided into "serious" and "moderate" classifications. The state and federal attainment status for the San Francisco Bay Area Basin are included in Table 2 (the national 1-hour ozone standard was revoked by the USEPA on June 15, 2005).

Areas that are designated as Severe 17 for the ozone standard must meet attainment of the 8-hour standard by 2021 (2024 if reclassified to Extreme). Areas considered as serious non-attainment of the PM_{10} standards must have reached attainment by the end of 2006, or as expeditiously as possible. The $PM_{2.5}$ attainment date is to be met in the year 2015.

Marginal nonattainment areas must meet the national 8-hour ozone standard by June 15, 2007. Specific planning requirements for 8-hour marginal nonattainment areas are not yet fully established, as EPA has not issued Phase 2 of the 8-hour implementation rule, and certain elements of the Phase 1 are subject to legal challenge. It is not currently anticipated that marginal areas will be required to prepare attainment demonstrations for the 8-hour standard. Other planning elements may be required. As 8-hour planning requirements become clear, the Bay Area will address the requirements in subsequent documents. In addition, in anticipation of the implementation rule, the BAAQMD is working in collaboration with the California Air Resources Board (CARB) and other northern California air districts through the Northern

California Agencies SIP/Transport Working Group to address 8-hour planning requirements for other regions in Northern California.

Table 2
Ambient Air Quality Standard & Attainment Status

Pollutant	Averaging Time	California Standard		Federal Primary Standard		Major Pollutant Sources
		Concentration	Attainment Status	Concentration	Attainment Status	
Ozone (O_3)	1 hour	0.09 ppm	N	*	*	Motor vehicles, paints, coatings, and solvents.
	8 hours	0.07 ppm	N	0.075 ppm	A	
Carbon Monoxide (CO)	1 hour	20 ppm	A	35 ppm	A	Internal combustion engines, primarily gasoline-powered motor vehicles.
	8 hours	9.0 ppm	A	9 ppm	A	
Nitrogen Dioxide (NO_2)	Annual Average	0.030 ppm		0.053 ppm	A	Motor vehicles, petroleum-refining operations, industrial sources, aircraft, ships, and railroads.
	1 hour	0.18 ppm	A	*	*	
Sulfur Dioxide (SO_2)	Annual Average	*		0.03 ppm	A	Fuel combustion, chemical plants, sulfur recovery plants, and metal processing.
	1 hour	0.25 ppm	A	*	*	
	24 hours	0.04 ppm	A	0.14 ppm	A	
Suspended Particulate Matter (PM_{10})	Annual Arithmetic Mean	20 $\mu g/m^3$	N	*	*	Dust and fume-producing construction, industrial and agricultural operations, combustion, atmospheric photochemical reactions, and natural activities (e.g. wind-raised dust and ocean sprays).
	24 hours	50 $\mu g/m^3$	N	150 $\mu g/m^3$	U	
Suspended Particulate Matter ($PM_{2.5}$)	Annual Arithmetic Mean	12 $\mu g/m^3$	N	15 $\mu g/m^3$	A	Dust and fume-producing construction, industrial, and agricultural operations, combustion, atmospheric photochemical reactions, and natural activities (e.g. wind-raised dust and ocean sprays).
	24 hours	*	N	35 $\mu g/m^3$	U	
Lead (Pb)	Monthly	1.5 $\mu g/m^3$	A	*	*	Present source: lead smelters, battery manufacturing & recycling facilities. Past source: combustion of leaded gasoline.
	Quarterly	*	*	1.5 $\mu g/m^3$	A	
Sulfates (SO_4)	24 hours	25 $\mu g/m^3$	A	*	*	Industrial processes.

ppm: parts per million; $\mu g/m^3$: micrograms per cubic meter
N = Non-attainment, A = Attainment, U = Unclassified
* = standard is not used for this pollutant/duration by this entity.
Source: BAAQMD 2008b

2.2 STATE REGULATIONS

California began setting air quality standards in 1969 with the passage of the Mulford-Carrell Act, before NAAQS were established. In some cases there are considerable differences between state and federal

Standards in effect in California (ref. Table 2). This is because of the unique meteorological problems in the state and the differences of opinion from medical panels established by the CARB and the EPA regarding pollutant levels that protect susceptible members of the population from adverse health impacts with an adequate degree of safety. In addition to its more stringent ambient air quality standards, California uses more stringent regulations than the federal government for vehicle emissions, under a program administered by CARB.

The California Clean Air Act (CCAA), which became effective on January 1, 1989, provides a planning framework for attainment of the California Ambient Air Quality Standards (CAAQS). Nonattainment areas in the state were required to prepare plans for attaining the CAAQS.

The Clean Air Act, as amended in 1990, states that areas designated nonattainment for ozone pursuant to section 107(d) shall be classified at the time of such designation, under Table 3, by operation of law, as a Marginal Area, a Moderate Area, a Serious Area, a Severe Area, or an Extreme Area based on the design value for the area. The design value shall be calculated according to the interpretation methodology issued by the Administrator most recently before the date of the enactment of the Clean Air Act Amendments of 1990. For each area classified under this subsection, the primary standard attainment date for ozone shall be as expeditiously as practicable, but not later than the date provided in Table 3. Table 4 shows the nonattainment designations for CO under the amended CAA.

Table 3
Ozone Classifications and Attainment Dates

Area class	Design value*	Primary standard attainment date**
Marginal	0.121 up to 0.138	3 years after enactment
Moderate	0.138 up to 0.160	6 years after enactment
Serious	0.160 up to 0.180	9 years after enactment
Severe	0.180 up to 0.280	15 years after enactment
Extreme	0.280 and above	20 years after enactment
* The design value is measured in parts per million (ppm). ** The primary standard attainment date is measured from the date of the enactment of the Clean Air Amendments of 1990.		

Table 4
Carbon Monoxide Classifications and Attainment Dates

Area class	Design value	Primary standard attainment date
Moderate	9.1 - 16.4 ppm	December 31, 1995
Serious	16.5 and above	December 31, 2000

The Basin is currently classified as “serious” nonattainment of the state ozone standards, but is in attainment of the CO standards. For regions in any class, attainment plans are required to demonstrate a

5 percent per year reduction in the emissions of nonattainment pollutants or their precursors, unless all feasible measures are being employed.

The 1990 CAA Amendments represent a major revision of the original statute. They specify new strategies for attaining federal air quality standards, including mandatory 3 percent annual reductions of air pollutant emissions in areas exceeding federal standards, new offset requirements for new stationary sources of air pollutants, the scheduled introduction of low-emitting cars and trucks into the motor vehicle fleet, and the development of alternatives to the private automobile as the primary means of transportation.

The Office of Administrative Law approved the final rulemaking package on the At-Berth Ocean-Going Vessels Regulations and filed it with the Secretary of State on Decmber 3, 2008. The rule became effective January 2, 2009 Section, 93118.3, Title 17, Chapter 1, Subchapter 7.5 of the California Code of Regulations (CCR) requires that all terminal operators to submit plans to the CARB by July 1, 2009, describing how the terminals will accommodate visiting vessels' need to transfer from vessel-based power to shore-based power and shut down onboard vessel auxiliary diesel engines. The purpose of these rules is to reduce NOx, particulate matter, and greenhouse gas emissions associated with vessel hoteling and other onboard power needs. The terminal will also be required to supply the name and Lloyd's number of each visiting vessel that is able to meet the regulation (i.e. transfer vessel power needs to the shore-based power source at the terminal). The regulations require that on or before January 1, 2014, at least 50 percent of visiting vessel fleets shall be able to transfer vessel power needs to the onshore power source. On or before January 1, 2017, at least 70 percent of visiting vessel fleets shall be able to transfer vessel power needs to the onshore power source, and by January 1, 2020, at least 80 percent of the visiting vessel fleets shall be able to transfer to the onshore power source. These rules apply only to container vessels, refrigerated vessels and passenger ships. Shore based power was not found to be cost-effective for oil product tankers. Other alternatives are being explored by the California Air Resouces Board (CARB) to address emissions associated with tankers. Regulations are being developed at this time to reduce emissions from oil tankers.

2.3 BAY AREA AIR QUALITY MANAGEMENT DISTRICT (BAAQMD), THE CLEAN AIR PLAN, AND THE OZONE STRATEGY

The BAAQMD has jurisdiction over the San Francisco Bay Air Basin, including Contra Costa County. The BAAQMD has permit authority over all stationary sources of air pollutants and acts as the primary reviewer of air quality issues in environmental documents. The agency also provides technical and monitoring support, as well as enforcement of rules and regulations. The BAAQMD was also mandated to meet state standards by the earliest date achievable using reasonably available measures.

The *Bay Area 1991 Clean Air Plan* (*CAP*), adopted on October 30, 1991, was prepared in response to requirements of the CCAA. The Plan included methods to lower ground-level O_3 in the San Francisco Bay Area and included a comprehensive strategy to reduce air pollution throughout the Basin. The *1991 CAP* focused on control measures to be implemented during the 1991 to 1994 period and also included control measures to be implemented from 1995 through the year 2000 and beyond.

The Plan was updated to the *Bay Area 1994 CAP* in 1994 and serves as a continuation of the comprehensive strategy established in 1991. The 1994 Plan included changes in the organization and scheduling of some *1991 CAP* measures and also included eight newly proposed stationary and mobile source control measures. The *1994 CAP* included a comprehensive strategy to reduce air pollutant emissions, focused on control measures to be implemented during the 1994 to 1997 period, and also included control measures to be implemented from 1998 through the year 2000 and beyond.

The *CAP* was again updated in 1997. This Plan was a continuation of the comprehensive strategy established in the region's first Plan, the *1991 CAP*, to attain the state ozone standard. The *Bay Area 1997 CAP* included changes in the organization and scheduling of some *1994 CAP* control measures and also included 12 proposed new stationary and mobile source control measures, as well as two new transportation control measures. The *1997 CAP* covered the period to the next California air quality planning update of 2000. It also included projections of pollutant trends and possible emission reduction activities beyond 2000.

The goals of the *CAP* are to reduce the health impacts from O_3 levels to below the state ambient standard and to comply with the CCAA. The Act requires air districts that exceed the state ozone standard to reduce pollutant emissions by 5 percent per year, calculated from 1990, or take all feasible measures to achieve emission reductions. The Bay Area attained the state CO standard in 1993, so the CCAA planning requirements for CO nonattainment areas no longer apply to the Bay Area. The control measures proposed in the *CAP* constitute all feasible measures for the reduction of O_3 precursor emissions in the Bay Area.

The most current *CAP* was the *Bay Area 2000 Clean Air Plan and Triennial Assessment* adopted December 20, 2000. Consistent with CCAA requirements, the strategy for this air quality plan is to implement all feasible measures on an expeditious schedule in order to reduce ozone precursor pollutant emissions as quickly as possible. As in previous iterations of the *Clean Air Plan*, this update defines feasible measures as "those control measures which are: (1) reasonable and necessary for the San Francisco Bay Area; (2) capable of being implemented in a successful manner within a reasonable period of time, taking into account economic, environmental, legal, social, and technological factors; and (3) approved or approvable by the California Air Resources Board, based upon state law and CARB policies."

The focus of this Plan update is on measures that could be developed and adopted as regulations over the following three-year period (2001, 2002, and 2003). To update the Plan, the BAAQMD staff examined measures from the *1997 Clean Air Plan* that had not yet been implemented. In addition, staff evaluated possible new control measures through an extensive review of rules adopted or proposed in other jurisdictions. In conducting this review, the BAAQMD evaluated the following information:

- Regulations adopted or proposed by the South Coast AQMD and by other California air districts,
- State Implementation Plan (SIP) submittals by various states,
- CARB guidance on feasible control measures,
- BAAQMD BACT guidance, and
- EPA guidance documents.

In addition to reviewing the above sources of information, the BAAQMD staff polled its engineers and enforcement staff for suggestions about potential control measures. All potential control measures were then evaluated based on emission reduction potential, technological feasibility, enforceability, cost-effectiveness, and public acceptability to determine whether measures would be feasible for the Bay Area. The measures that appeared feasible were added to the regulatory agenda. This review showed that the following new measures should be added to the *CAP*:

- Improved Automobile Refinish Coatings Rule,
- Improved Wood Products Coatings Rule,
- VOC limits for Concrete Coating Operations, and
- Improved Residential Water Heaters Rule.

This *CAP* update, like the updates in 1994 and 1997, increases *CAP* effectiveness by increasing expected emission reductions. The net effect of the 2000 update in adding new control measures while deleting some of the old measures was to increase expected emission reductions by 3.7 tons per day. By comparison, the 1994 update added three and deleted five stationary source measures, while adding five mobile source measures. The net effect of the 1994 update was to increase expected emission reductions by 3.8 tons per day. The 1997 update added six and deleted two stationary source measures. The net effect of the 1997 update was to increase expected emission reductions by 2.2 tons per day. Though it is not possible or meaningful to compare the 1991 estimate for total emission reductions expected from the plan against current estimates because many emission factors used to make emission inventory and emission reduction estimates have changed since 1991, the total emission reduction attributable to the plan has increased with each update. The major benefits of the *CAP* are reduced health impacts from population exposure to O_3. Additional expected benefits are reductions in particulate matter, traffic congestion, energy use, global warming, crop damage, and water pollution.

The 2009 Bay Area Clean Air Plan is currently under preparation. The *2009 CAP* will update the 2005 Bay Area Ozone Strategy in order to implement "all feasible measures" to reduce ozone based on the requirements of the CCAA. The *2009 CAP* will also consider the impacts of ozone control measures on particulate matter, air toxics, and greenhouse gases in a single, integrated plan; review progress in improving air quality in recent years; and establish emission control measures to be adopted between 2009 and 2012.

As noted, the first *CAP* for the state ozone standard was the *1991 Clean Air Plan*. Subsequently, the *Clean Air Plan* was updated and revised in 1994, 1997, and 2000. Each of these triennial updates proposed additional measures to reduce emissions from a wide range of sources, including industrial and commercial facilities, motor vehicles, and area sources. The BAAQMD released the *Bay Area 2005 Ozone Strategy* (*Ozone Strategy*) in January 2006, replacing the *2000 CAP*.

The *Ozone Strategy* describes how the Bay Area would fulfill CCAA planning requirements for the state one-hour ozone standard and transport mitigation requirements through the proposed control strategy. The control strategy includes stationary source control measures to be implemented through the BAAQMD regulations; mobile source control measures to be implemented through incentive programs and other activities; and transportation control measures to be implemented through transportation programs in cooperation with MTC, local governments, transit agencies, and others. Under the *Ozone Strategy*, the BAAQMD will continue to adopt regulations, implement programs, and work cooperatively with other agencies, organizations and the public on a wide variety of strategies to improve air quality in the region and reduce transport to neighboring air basins.

The *2005 Ozone Strategy* explains how the Bay Area plans to achieve these goals with regard to ozone and also discusses related air quality issues of interest, including the public involvement process, climate change, fine particulate matter, the BAAQMD's Community Air Risk Evaluation (CARE) program, local benefits of ozone control measures, the environmental review process, national ozone standards, and photochemical modeling.

The CCAA requires CARB to periodically assess transport of ozone and ozone precursors from upwind to downwind regions, and to establish mitigation requirements for upwind districts. The CCAA also requires air districts to address transport mitigation requirements in the triennial updates to strategies to achieve the state ozone standard.

The *Ozone Strategy* provides a mechanism whereby the Bay Area is to:

- adopt and implement all feasible measures as expeditiously as practicable,
- adopt and implement best available retrofit control technology (BARCT) on all existing stationary sources of ozone precursor emissions as expeditiously as practicable,

- implement a stationary source permitting program designed to achieve no net increase in the emissions of ozone precursors from new or modified stationary sources that emit or have the potential to emit 10 tons or greater per year of an ozone precursor,
- strengthen existing air control measure requirements for various stationary and area source emissions, and
- include measures sufficient to attain the state ambient air quality standard for ozone by the earliest practicable date within the North Central Coast Air Basin, that portion of Solano County within the Broader Sacramento Area, that portion of Sonoma County within the North Coast Air Basin, and that portion of Stanislaus County west of Highway 33 during air pollution episodes, provided that:
    - the areas are likely to violate the state ozone standard,
    - the areas are dominated by transport from the Bay Area, and,
    - the areas are not affected by emissions of ozone precursors within their borders.

In addition, the BAAQMD is required to consult with downwind districts, review the list of control measures in the most recently approved attainment plan (*2000 Clean Air Plan*), make a finding as to whether the list of control measures meets the applicable requirements, and include the finding in the proposed triennial plan revision.

SECTION 3.0 – EXISTING CONDITIONS AND METHODOLOGY

3.1 EXISTING CONDITIONS AT THE SHELL MARTINEZ MARINE TERMINAL

3.1.1 Components

The components of the Shell Martinez Marine Terminal and vessels that are sources of emissions are discussed below. Actual emissions quantities are presented and analyzed in the impacts analysis in Section 4.2.1, Site Operations.

Like all facilities that deal with the movement of liquid materials, the Shell Martinez Marine Terminal wharf includes a large number of pumps, valves, flanges, and pressure relief devices. In the absence of a vapor control system (VCS), hydrocarbon vapors escape from the cargo compartment when they are displaced during liquid product loading. If ignored, these fittings can develop small leaks that ultimately release reactive organic gas (ROG) emissions into the air. The VCS, installed in 1991, complies with the U.S. Coast Guard (USCG) Regulation 33 CFR 154 for VCS operations. The system also complies with the BAAQMD Regulation 8-44 (Organic Compounds, Marine Vessel Loading Terminals), which limits hydrocarbon emissions to the atmosphere from marine vessels being loaded under certain conditions (e.g., loading with high vapor pressure products). The VCS also meets the CSLC Structural Requirements for Vapor Control Systems at Marine Terminals (CCR Title 2, Division 3, Chapter 1, Article 5.4).

3.1.2 Loading Operations

A primary source of POC emissions from marine terminal operations is from loading activities. Loading losses occur as POC vapors in “empty” cargo tanks are displaced to the atmosphere during liquid product loading. The emissions are a composite of vapors generated from the evaporation of residual liquids and vapors formed in the tank as new liquids are loaded. The quantity of vapors depends on the physical and chemical characteristics of both the previous cargo and the new cargo and the methods of loading. A VCS is used to capture and destroy POC emissions from the loading of petroleum liquids.

3.1.3 Crude Oil Ballasting

Ballasting is the practice of loading several cargo tank compartments with seawater after the cargo has been offloaded. Ballasting of cargo tanks reduces the quantity of emissions emitted during subsequent tanker loading. During the ballasting process, POC emissions escape to the atmosphere as the vapors from nonsegregated tanks are displaced with “ballast” water. These emissions are not controlled by a VCS. As reported by Shell, ships do not ballast at the Shell Martinez Marine Terminal.

3.1.4 Fugitives (Pumps, Valves, and Flanges)

There are numerous pipelines associated with the Shell Martinez Marine Terminal that transport petroleum liquids between the upland facility and the wharf. The pumps, valves, and flanges associated with these pipelines are sources of fugitive emissions of POC and methane (CH_4). The leakage from these components is a function of the liquid being transported and the effects of variables, such as pressure, vibration, friction, heat, and corrosion. Less than one percent of total emissions is anticipated with respect to these components.

3.1.5 Vessels

Vessels (tankers and barges) that call on the Shell Martinez Marine Terminal contribute indirect emissions to terminal operations. These emissions are generated from the combustion of fuel oil by the vessel engines and generators as they travel, as well as emissions generated from auxiliary engines used to provide electrical and accessory power while ships are "hoteling" (docking while off-loading raw materials or on-loading product) at the wharf.

3.1.6 Overall Operations

Maximum throughput is based on Shell's Bay Area Air Quality Management District Title V Permit to Operate for the Refinery and the Terminal. Terminal throughput ranges from 17,000,000 barrels per year (bpy) (current) to 27,000,000 bpy (anticipated maximum). Annual ship and barge traffic currently averages 265 vessels per year. Future estimates are 260 to 330 vessels per year. Future increases are based on increases in crude oil receipts.

Shell records indicate that from 1994 to 2004, the Shell Martinez Marine Terminal handled a maximum of 420 annual vessel calls at a volume of 48,300,000 bpy. The maximum capacity that the Shell Martinez Marine Terminal could handle is 50,000,000 bpy, with increases expected from crude oil shipments rather than product deliveries. Future deliveries are expected to be via larger crude transport vessels, thus reducing the number of annual vessel calls. This anticipated range is based on increased Shell Martinez Marine Terminal use via increased crude oil receipts rather than product deliveries. At this time, Shell does not have any immediate plans to modify the Shell Martinez Marine Terminal over the 30-year term of the proposed lease, other than possibly to dredge and use the currently inactive Berths # 3 and # 4. The maximum amount of future vessel calls, 330 vessel calls, served the basis for the impact analysis in Section 4.0, Existing Environment and Impacts Analysis, assuming no new Shell Martinez Marine Terminal construction.

3.2 METHODOLOGY

The impact analysis contained in this report was prepared in accordance with the methodologies provided by the BAAQMD in the "BAAQMD CEQA Guidelines Assessing the Air Quality Impacts of Projects and

Plans" (CEQA Guidelines 1999). Regional impacts for operations are assessed using emission factors obtained from and methodologies accepted by the BAAQMD, CARB and the EPA.

3.2.1 Baseline Emissions

In order to assess the potential for an air quality impact, it is necessary to determine the baseline emissions associated with the operation of the Shell Martinez Marine Terminal. For the purposes of the following analysis there are two baseline emission scenarios. The 1995 GHG emissions presented in the impact section below represents the "permitted baseline". Shell records from 1995 indicate that 363 vessels called on the wharf in 1995 without exceeding their overall emissions cap. Therefore it can be assumed that Shell can operate with the proposed increase of up to 330 vessels without exceeding their overall emissions cap.

The 2007 emission calculations which is base on 196 vessal calls, presented below represent the "CEQA baseline" as defined by CEQA.Guideline 15125(a) which states "An EIR must include a description of the physical environmental conditions in the vicinity of the project, as they exist at the time the notice of preparation is published, or if no notice of preparation is published, at the time environmental analysis is commenced, from both a local and regional perspective. This environmental setting will normally constitute the baseline physical conditions by which a lead agency determines whether an impact is significant."

The Refinery wharf emissions are regulated as part of Shell's Major Facility Title V permit. Specifically, the wharf emissions are included in Shell's Refinery Emissions Cap (REFEMS), as specified in Permit Condition Number 7618. The REFEMS permit condition sets emission limits for over 70 sources in addition to the wharf emissions and an emissions cap on the total emissions for the sum of these sources. Pollutants regulated are carbon monoxide, nitrous oxides, hydrocarbons, sulfur dioxide, and particulate emissions. The REFEMS Cap is based on a "rolling year" basis that includes the most current 365-day period.

In general, the Shell Martinez Marine Terminal emissions are calculated in three main parts:

- maneuvering,
- hoteling, and
- pumping.

Emission factors are used for each of these three phases of wharf operation that take into account the vessel type/size/fuel and cargo material. Use of the emission factors in conjunction with the time required for the various modes of operation allows the emissions to be calculated.

For the purposes of this analysis, it is necessary to separate out those emissions specifically associated with the operation of the wharf. Discussion with Bhagavan Krishnaswamy of the BAAQMD (personal

conversation, December 13, 2005) revealed that there is no clear interpretation of how the wharf emissions were segregated in the initial permitting process conducted in 1980. Furthermore, Shell data for this time period are also lacking. In addition, wharf operations at that point in time were considerably greater than current operations, and over 400 vessels per year was common.

Existing accessible records for emissions related to Shell Martinez Marine Terminal operations go back to 1995. Shell records indicate that 1995 ship traffic was considerably heavier than current levels. In all, 363 vessels called on the wharf in 1995, which is a representative sampling. This value (i.e., 363 vessels per year) is used to represent baseline conditions with respect to permitted operations conducted for the wharf.

As noted, the wharf operations are included in the REFEMS along with various aspects of the Shell Refinery and its operations. As long as Shell complies with the total REFEMS Cap, the BAAQMD is satisfied that the permit has not been violated. For the purposes of this analysis, data collected in 1995 are used to determine that percentage of the total emissions that were attributed to wharf operations. This same percentage is then used to represent the total allowable emissions under the emissions Cap. In reality, if wharf emissions were to exceed this percentage and the total emissions generated under the REFEMS Cap were to be exceeded, the Refinery could and would make cutbacks in other processes included under the REFEMS permit to reduce emissions to less than REFEMS Cap levels. Therefore, using the methodology as presented here would represent a reasonable worst-case scenario because it essentially makes the wharf stand on its own merit. Table 5 presents the 1995 emissions data used in determining the wharf's contribution to be used as the baseline conditions. Note that while CO is included in the REFEMS Cap, it is not calculated for the 1995 wharf emissions. Furthermore, the Bay Area is in attainment of the CO standards. As such, it is unlikely that CO emissions would be responsible for a significant impact, unless other emissions were also shown to exceed the applicable limitations.

Table 5
1995 Shell Martinez Marine Terminal Annual Inventory Used in Generating Baseline Emissions (tons)

Source	NO_X	POC	PM_{10}	SO_X
Total Wharf Emissions (tons/yr)[1]	149.3	37.2	13.9	141.6
Total REFEMS Emissions (tons/yr)[2]	3,115.9	145.7	263.8	1,475.1
Percentage of Total REFEMS	4.8	25.6	5.2	9.6
Total REFEMS Regulatory Limit (tons/yr)[3]	3,674.7	336.8	298.8	3,006.4
Regulatory Wharf Limit (tons/yr)[4]	176.4	86.2	15.5	288.4

[1] Includes those activities directly related to the operations and maintenance of the marine terminal including ship and tug emissions.
[2] Includes all sources, including wharf activities, permitted under the REFEMS Permit.
[3] Maximum emissions allowable under the REFEMS Permit.
[4] Represents the wharf's percentage of the REFEMS emissions times the total allowable emissions under the REFEMS Permit.

As noted in Table 5 NO_x and PM_{10} are the pollutants of primary concern because they are ozone precursors, and the Bay Area does not attain the ozone standard. Furthermore, these emissions are closest to their applicable REFEMS Cap limitations.

The REFEMS Cap limitations are dynamic and change with available technology and regulations. Similarly, wharf operations are modified to keep track of these changes such that the combined operations of the wharf and that portion of the Refinery that is tied into the REFEMS remain well within the limits of the REFEMS Cap. Table 6 compares year 2007 estimated emissions with year 1995 emissions data with respect to the limits of the REFEMS Cap. Note that under the conditions of the REFEMS, neither POC nor SO_x have changed with respect to the Cap. On the other hand, both NO_x and particulates show reduction from past levels with respect to the Cap even though emissions limitations under the Cap have become increasingly more stringent.

Table 6
1995 Baseline Compared to 2007 REFEMS Annual Inventory With Respect to the REFEMS Cap (tons)

Source	NO_x		POC		PM_{10}		SO_x	
	1995	2007	1995	2007	1995	2007	1995	2007
Wharf Percent of Total Actual REFEMS Total Emissions	26%	11%	5.2%	5%	8%	10%	5%	8%
Wharf Percent of Permitted REFEMS Cap	11%	5%	4.6%	4%	4%	5%	4%	6%
Shell Combined Percent of Total Permitted REFEMS Cap	43%	43%	88%	81%	49%	49%	85%	75%

3.3 THRESHOLDS OF SIGNIFICANCE

3.3.1 Permitted Emissions

The air quality impacts of the Project would be considered adverse and significant if Shell does not comply with the terms of the Permit to Operate granted by the BAAQMD. The CEQA Guidelines state the following*: "Sources of air pollutants emissions complying with all applicable district regulations generally will not be considered to have a significant air quality impact"* (CEQA Guidelines, section 15064(l)). Stationary sources that are exempt from the BAAQMD permit requirements, because they fall below emission thresholds for permitting, will not be considered to have a significant air quality impact (unless it is demonstrated that they may have a significant cumulative impact).

3.3.2 Non-Permitted Emissions

In accordance with the BAAQMD *Guidelines* (December 1999), non-permitted emissions could have a significant, adverse impact if Project operations:

- Contribute to an exceedance of localized CO emissions in excess of the CAAQS of 20 ppm for 1-hour or 9 ppm for 8 hours;
- Result in emissions which exceed the following emission thresholds:

  ROG, 15 tons/year, 80 lbs/day;

  NO_x, 15 tons/year, 80 lb/day;

  PM_{10}, 15 tons/year, 80 lbs/day;

- Allow land uses that create objectionable odors;
- Expose sensitive receptors (including residential areas) or the general public to substantial levels of toxic air contaminants; or
- Potentially result in the accidental release of acutely hazardous air emissions.

3.3.3 Cumulative Emissions

Cumulative impacts are considered significant, based on the *Guidelines* definition, as follows: "Any Project that would individually have a significant air quality impact would also be considered to have a significant cumulative impact."

3.3.4 Construction Emissions

The Project is the renewal of the lease for the Shell Martinez Marine Terminal and does not propose construction of any new or expanded facilities. Dredging operations for the removal of silt from the inner berths are considered maintenance of the existing facilities and are assessed as a periodic operational activity included in the current lease. Therefore, construction period emissions are a part of the baseline conditions and are not further analyzed.

SECTION 4.0 – ENVIRONMENTAL IMPACTS

The calculated emissions of the Project are compared to thresholds of significance for individual projects using the BAAQMD *Guidelines* as well as updates included on the BAAQMD Internet website. The *Guidelines* recommend assessing emissions of reactive organic compounds (ROG) as an indicator of ozone. For ease of the reader, the included analysis follows the outline of the CEQA Checklist.

4.1 PROJECT CONSISTENCY WITH THE APPLICABLE AIR QUALITY PLAN

Permitted emissions include those emissions that are considered a part of the ambient air quality in the local and regional area, and have been included in the Bay Area regional air quality planning process. The Shell Martinez Marine Terminal emissions associated with operation of the vapor recovery/thermal oxidizer, loading operations, and fugitive sources (tanks, pumps, valves, and flanges) are covered under permits to operate pursuant to the requirements of BAAQMD Regulation 2 (BAAQMD 2007). Tanker maneuvering and hoteling, tanker pumping, tugboats, etc., are calculated, as described in the Title V Permit for the Shell Martinez Marine Terminals' facility, and included as part of the permitted emissions of the entire facility (wharf and upland tankage) as specified under the REFEMS, but are not individually permitted by the BAAQMD.

Due to the availability of accurate data, year 1995 was selected as a baseline year for permitting purposes, and wharf activities were segregated from those other processes included in the REFEMS. In accordance with Table 5, these levels are:

NOx: 176.4 tons/year
POC: 86.2 tons/year
SO_X: 288.4 tons/year
PM_{10}: 15.5 tons/year

Emissions are influenced by a number of variables, most significantly product throughput and mode of transport. All products received by the facility are loaded into storage tanks. Emissions of vapors expelled from the loading procedure are controlled using the vapor recovery system, which consists of a vapor combustion unit called a thermal oxidizer, associated piping from fixed roof tanks, and the marine vessel loading area. Incoming liquid products shipped from the Shell Martinez Marine Terminal into a vessel, railcar, or other container displace existing vapors in the tanks. Products shipped from the Terminal into a pipeline do not displace vapor at the facility, and therefore do not cause additional emissions.

The Shell facility uses continuous emission monitors and source sampling to provide computerized monthly criteria pollutant emission inventory to the BAAQMD. The limits set by the BAAQMD were determined to be sufficient to account for these emissions. Other emissions include indirect emission sources, such as tug combustion emissions, tanker hoteling, tanker transit, and tanker pumping. These

indirect emissions are not permitted; however, they are calculated per the permit conditions specified in the Shell Martinez Marine Terminal's Title V Permit and considered as part of the overall emissions of the facility.

Section 3.1, Existing Conditions at the Shell Martinez Marine Terminal, describes baseline conditions taken at a point in time when reliable data became available (1995). Shell reports in that year, 363 vessels called on the Shell Martinez Marine Terminal. While other years have seen in excess of 400 ships without permit violation, for the purposes of this analysis the baseline is based on emissions associated with these 363 ships.

Recent years have seen a decline in Shell Martinez Marine Terminal use. Between the years 1999 and 2005, an average of 196 vessels called on the Shell Martinez Marine Terminal. Table 5 in Section, 3.2.1, Baseline Emissions, demonstrates that the emissions associated with the operation of the Shell Martinez Marine Terminal are well within the regulatory limitations of the existing permit on file with the BAAQMD. The permit has been in place since 1980, and these emissions have been considered in the *Clean Air Plan* and *Ozone Strategy*. Because Shell operates the Refinery and Shell Martinez Marine Terminal well within REFEM Cap limitations, the continued operation of the Project does not conflict with or obstruct implementation of the applicable Plans, and the impact is adverse but less than significant.

Shell estimates that over the life of the lease, Shell Martinez Marine Terminal operations could expand from present levels to as many as 330 vessels per year. This would represent an increase of about 68 percent over the current vessel traffic (i.e., 196 vessels per year), yet a decrease of permitted baseline. Assuming that the emissions generated from wharf operations are directly proportional to the number of vessels, Table 7 compares future emissions with baseline and existing emissions as well as those limitations under the REFEMS Cap used in the preparation of baseline emissions. Note that even at 330 vessels (proposed lease) per year, Shell Martinez Marine Terminal operations would not exceed the limitations of the REFEMS Cap, and the impact is adverse but less than significant.

Table 7
Emissions Associated With Terminal Operation (tons)

Source	POC Tons/yr	NO_X Tons/yr	SO_X Tons/yr	Exhaust PM_{10} Tons/yr	Fugitive PM_{10} Tons/yr	Total PM_{10} Tons/yr	Total $PM_{2.5}$ Tons/yr
Terminal Emissions (1995)	37.23	149.28	141.55	13.89	0.00	13.89	12.78
Terminal Emissions (2007)	20.10	80.60	76.43	7.50	0.00	7.50	6.90
Terminal Emissions (proposed Lease)	33.84	135.71	128.68	12.63	0.00	12.63	11.62
REFEMS Terminal Limit	86.20	176.40	288.40	-	-	15.50	-
Exceed Limit?	No	No	No	-	-	No	-

4.2 PROJECT POTENTIAL TO VIOLATE OR ADD TO A VIOLATION OF AN AIR QUALITY STANDARD

CEQA inquires as to whether a project would violate any air quality standard or contribute substantially to an existing or projected air quality violation. A violation could occur over the long-term during its operation and/or over the short-term during occasional temporary construction activities (dredging). Each is addressed below.

4.2.1 Site Operations

While the number of vessels is estimated to increase by approximately 68 percent over current levels, at full projected use (i.e., 330 vessels per year) the number of vessels that call on the Shell Martinez Marine Terminal is less than the 363 vessels used in the generation of baseline conditions, or even the peak levels of up to 420 vessels per year observed during the 1980s. As such, the existing number of plant personnel could handle the projected volume of vessels, and any increase in the number of on-road trips associated with the augmented operation of the Shell Martinez Marine Terminal would be minimal. Impacts are adverse, but less than significant.

4.2.2 Periodic Maintenance Activities

No major construction is proposed as part of the 30-year lease. Upgrades, maintenance, and repair expected as part of the 30-year lease renewal are considered minor in nature and would not contribute significantly to the baseline emissions. Shell is required to notify the CSLC of major repairs, which CSLC staff reviews for environmental applicability, among other criteria. Over the lease period, it is anticipated that the area in and around Berths #3 and #4 would be dredged.

Dredging around Berths #3 and #4 would create short-term emissions. Dredging would be of short duration (probably less than one week), and would not add to the long-term emissions associated with the day-to-day operation of the wharf. This would probably be performed using a clamshell dredge. A clamshell dredge is essentially a crane or dragline mounted on a barge. The clamshell could use a diesel engine of approximately 1,050 horsepower (hp). The dredge would also be fitted with one or two auxiliary generators with a combined rating assumed at approximately 500 hp.

Dredged sediments would be loaded on a barge or scow for subsequent delivery. This barge would be pulled using a tugboat. The tugboat could also be used in positioning the dredge. Tugboats can be powered by engines ranging in size from a few hundred hp to as much as 3,600 hp. This analysis used a mid-range engine (i.e., 1,800 hp) in ascertaining vessel emissions. To derive tugboat emissions, fuel consumption must first be ascertained. Presented below are the specifics for marine vessel fuel consumption.

Fuel Type	Diesel
Sulfur Content	0.20 percent
Fuel Density	7.12 lb/gal
Specific Fuel Consumption	0.40 lb/hp/hr
Idle Load Factor	0.20
Maneuver Load Factor	0.50
Cruise Load Factor	0.80

Typically, one barge would be loaded while another is underway to and from the disposal site. In this way, little or no time would be lost waiting for equipment to perform its respective task.

In compliance with construction noise requirements, the dredge and its related equipment is anticipated to operate approximately 14 hours per day between 7:00 a.m. and 10:00 p.m. This would allow 1-hour downtime for equipment maintenance and worker breaks.

A tug is also assumed to be used in dredge placement and to remove spoils from the area. Spoils would probably be taken to the Alcatraz Island disposal area approximately 32 miles from the Project site. A round-trip is estimated at about 12 hours. An additional one hour is assumed at idle, and one hour is assumed for maneuvering (14 hours per day). Emissions for the tug were calculated using AP-42, A Compilation of Air Pollutant Emissions Factors (AP-42) (USEPA, 1985). Because emissions for marine vessels vary widely and AP-42 does not present emissions for either SO_X or PM_{10} for marine vessels, emissions factors for diesel industrial engines were utilized for these two pollutants. These emissions are provided in gm/hp-hr as well as lb/103 gallons and are roughly equivalent to emission factors provided for the higher polluting heavy construction equipment.

Based on a rating of 1,800 hp, the tugboat would consume approximately 20 gallons per hour at idle, 51 gallons per hour when maneuvering, and 81 gallons per hour at cruise. Therefore, based on the noted hours of operation, the tugboat could consume approximately 1,043 gallons per day.

As many as 10 workers are allocated to operate the dredge and tug. The workers would produce emissions commuting to and from the site. According to the BAAQMD, the average home-to-work trip length in the San Francisco Bay area is 11.8 miles for urban travel. A similar value is presented for commercial-based commutes. As such, the 10 workers are estimated to generate approximately 236 miles per day. Emissions associated with these trips were estimated in accordance with the EMFAC2007 computer model distributed by the CARB using data specific to the Bay Area Air Basin. A crew boat

would be used to shuttle workers to and from the dredge. However, the boat could be stationed at the Shell Martinez Marine Terminal or neighboring Martinez Marina, and any emissions associated with the movement of personnel between the shore and the equipment would be inconsequential.

Table 8 outlines the projected emissions associated with the use of a clamshell dredge and the tugboat. Because these represent short-term emissions associated with the "construction" of a deeper channel, they are not subject to the day-to-day operations' criteria so long as all PM_{10} suppression methods included in the BAAQMD *Guidelines* are administered. Note that all of the measures included in the *Guidelines* focus on the reduction of PM_{10} associated with fugitive dust. No fugitive dust emissions are raised during the dredging of wet sediment, and none of the measures address PM_{10} associated with exhaust. As such, construction emissions associated with short-term dredging are adverse, but less than significant.

4.3 PROJECT POTENTIAL TO RESULT IN A CUMULATIVELY CONSIDERABLE INCREASE IN CRITERIA POLLUTANTS

The proposed Project and other projects in the region will continue to generate air emissions over the life of the lease and thereby contribute to cumulative emissions within the region. At the level of current operations, Shell Martinez Marine Terminal emissions are within the existing baseline conditions and will not contribute additional emissions to the cumulative impact. The potential future increase in operations (which is still within baseline levels) could result in potentially significant adverse impacts that would be reduced to a level of adverse, but less than significant through the use of improved technology and BAAQMD requirements.

Table 8
Daily Emissions For Vessels and Equipment Associated With Dredging Operations (lbs/day)

Source	CO lb/day	POC lb/day	NO_X lb/day	SO_X lb/day	Exhaust PM_{10} lb/day	Fugitive PM_{10} lb/day	Total PM_{10} lb/day	Total $PM_{2.5}$ lb/day
Permitted Sources:								
Dredge	80.85	10.39	352.80	23.81	10.29	14.71	10.29	9.47
Generator	46.76	17.61	217.00	14.35	15.40	0.00	15.40	14.17
Total Permitted Sources:	**127.61**	**27.99**	**569.80**	**38.16**	**25.69**	**14.71**	**25.69**	**23.63**
Unpermitted Sources:								
Tugboat	87.71	22.48	361.25	24.38	10.29	0.00	10.29	9.46
Worker Commutes	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Un-Permitted Sources	**87.71**	**22.48**	**361.25**	**24.38**	**10.29**	**0.00**	**10.29**	**9.46**
Total Daily Emissions	**215.32**	**50.47**	**931.05**	**62.55**	**35.98**	**14.71**	**35.98**	**33.10**

4.4 PROJECT POTENTIAL TO EXPOSE SENSITIVE RECEPTORS TO SUBSTANTIAL POLLUTANT CONCENTRATIONS

Substantial pollutant concentrations are typically associated with fixed sources such as a refinery stack, or as carbon monoxide hot spots in areas where vehicles queue such as at an intersection. Because the wharf and its operations have been permitted through the BAAQMD, Shell has satisfied the requirements related to both toxic air contaminants and accidental release of acutely hazardous air emissions. Necessary hazardous and toxic pollutant modeling, as well as necessary contingency measures, have been submitted as part of the permitting process and are on file with the BAAQMD and are available on request. Impacts are adverse, but less than significant.

Furthermore, because operations at the Shell Martinez Marine Terminal require only a minimum of workers, and no substantial increase in the number of workers would occur even with future augmented operations, the Project would not result in the addition of vehicles to the road that would result in the formation of CO hot spots. The impact is adverse, but less than significant.

4.5 PROJECT POTENTIAL TO CREATE OBJECTIONABLE ODORS

The primary source of odors from the Shell Martinez Marine Terminal would be fugitive POC emissions escaping to the atmosphere during loading and unloading operations. These odors are typically removed in the vapor recovery system, which captures and destroys the POC in a thermal oxidizer. POCs are broken down to largely odorless compounds of water and carbon dioxide. No increase in odors would be expected due to the continued operation of the Shell Martinez Marine Terminal under the conditions of the proposed 30-year lease. Therefore, the impact is adverse, but less than significant.

4.6 IMPACTS OF ALTERNATIVES

4.6.1 No Project Alternative

Under the No Project Alternative, Shell's lease would not be renewed and the existing Shell Martinez Marine Terminal would be subsequently decommissioned with its components abandoned in place, removed, or a combination thereof.

Under the No Project Alternative, alternative means of crude oil/product transportation would need to be in place prior to decommissioning the Shell Martinez Marine Terminal; or the operation of the Shell Refinery would cease production, at least temporarily. It is more likely, however, that under the No Project Alternative, Shell would pursue alternative means of traditional crude oil transportation, such as pipeline transportation, or use of a different marine terminal.

For the purposes of this air quality analysis, it has been assumed that the No Project Alternative would result in a decommissioning schedule that would consider implementation of one of the described transportation alternatives. Any future crude oil or product transportation alternative would be the subject of a subsequent application to the CSLC and other agencies having jurisdiction, depending on the proposed alternative.

Decommissioning would be assumed to be accomplished primarily via the water with materials, other than those that can be used at the Shell Refinery, taken away via barge. The activity would require heavy equipment to be used in the demolition of the wharf and related structures. However, this would effectively curtail any ships from berthing at the terminal, and the reduction in emissions associated with terminating terminal operations would compensate for any emissions generated during demolition. Furthermore, demolition of the wharf would be construed as construction; and as noted for dredging operations, construction is considered as adverse, but less than significant as long as all feasible dust implementation measures presented in the BAAQMD *Guidelines* are adhered to. Impacts would be adverse, but less than significant.

After decommissioning, the operations associated with the Shell Martinez Marine Terminal would cease, resulting in a slight beneficial impact locally. However, for the air basin, operations would be transferred to other Bay Area marine terminals. These terminals would be subject to review by BAAQMD to determine whether the increase in operations would be in compliance with permitting. It is likely that any beneficial impacts at this terminal would result in increased impacts at other bay area marine terminals.

4.6.2 Full Throughput Alternative

The full throughput alternative would expand Shell Martinez Marine Terminal activities up to the engineering limits of the associated Refinery.

Construction of new or modified pipelines would be required to equal the projected maximum of 50,000,000 bpy (137,000 bpd) of crude receipts through the Shell Terminal to the Shell Refinery. This amount would equal the maximum throughput allowed on the Shell Terminal and Shell Refinery Title V Permit issued by the BAAQMD. Pipelines capable of handling this capacity may be viable from an environmental perspective. However, prior to construction and use, lengthy and complex regulatory processes, land availability and obtainment of easements or rights-of-way would be required, and environmental review and local permitting would be conducted.

This alternative assumes that with no Shell Terminal wharf to receive crude or transport product, pipelines would be used via connection to other Bay Area terminals to provide the daily throughput capacity to the Shell Refinery. Required modifications of the existing terminals would be subject to substantial environmental review and local permitting.

Existing terminals would pose no air quality impacts as long as they operate within BAAQMD permit conditions. Any expansion would require permitting under the requirements and guidance of the BAAQMD. Emissions associated with the existing Shell Martinez Marine Terminal could be banked and applied to the terminal expansion. If necessary, terminal owners/operators could reduce emissions at their inland facilities or purchase emissions offset credits such that no new emissions would be associated with any expansion and any impacts would be adverse, but less than significant.

Construction of new pipelines would be subject to requirements for dust suppression outlined in the BAAQMD *Guidelines* requiring dust suppression in accordance with the projected level of activity. Adherence to these requirements would ensure that any impacts remain adverse, but less than significant.

SECTION 5.0 – GLOBAL CLIMATE CHANGE

The California Global Warming Solutions Act of 2006 (AB 32) requires that greenhouse gases emitted in California be reduced to 1990 levels by the year 2020 and 80 percent below 1990 levels by 2050. The 2020 reduction target equates to a decrease of an average of 30 percent below the current GHG emissions. Two major sectors that will be targeted to achieve these reductions are the energy generation sector and cement plants.

5.1 GREENHOUSE GASES

Parts of the Earth's atmosphere act as an insulating blanket of just the right thickness, trapping sufficient solar energy to keep the global average temperature in a suitable range. The 'blanket' is a collection of atmospheric gases called 'greenhouse gases' (GHGs) that 'trap' heat like the glass walls of a greenhouse (EPA 2006b). These gases, mainly water vapor, carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), ozone, and chlorofluorocarbons (CFCs) all act as effective global insulators, reflecting back to earth visible light and infrared radiation. Human activities such as producing electricity and driving vehicles have contributed to the elevated concentration of these gases in the atmosphere (EPA 2006b).

The accumulation of GHG in the atmosphere regulates the earth's temperature. Without the natural heat trapping effect of GHG, the earth's surface would be about 34 degrees Centigrade (°C) cooler (CAT 2007). However, it is believed that emissions from human activities have elevated the concentration of these gases in the atmosphere beyond the level of naturally occurring concentrations. This in turn, is causing the Earth's temperature to rise. A warmer Earth may lead to changes in rainfall patterns, much smaller polar ice caps, a rise in sea level, and a wide range of impacts on plants, wildlife, and humans (EPA 2006b).

Individual GHG species have varying global warming potential (GWP) and atmospheric lifetimes. The reference gas for GWP is carbon dioxide; carbon dioxide has a GWP of one. Compared to methane's GWP of 21, it is clear that methane has a greater global warming effect than carbon dioxide on a molecule per molecule basis (EPA 2006b). As shown below in Table 9, GWP ranges from one (carbon dioxide) to 23,900 (sulfur hexafluoride).

Atmospheric lifetimes vary from 1.5 (HFC-152a) to 50,000 years (tetrafluoromethane). One teragram (equal to one million metric tons) of carbon dioxide equivalent (Tg CO_2 Eq.) is the mass emissions of an individual GHG multiplied by its GWP. The atmospheric lifetime and GWP of selected greenhouse gases are also summarized in Table 9.

Of all greenhouse gases in the atmosphere, water vapor is the most abundant, important, and variable. It is not considered a pollutant; in the atmosphere it maintains a climate necessary for life. The main source of water vapor is evaporation from the oceans (approximately 85 percent). Other sources include evaporation from other water bodies, sublimation (change from solid to gas) from ice and snow, and transpiration from plant leaves.

Ozone is a greenhouse gas; however, unlike other GHG, ozone in the troposphere is relatively short-lived and therefore is not global in nature. It is difficult to make an accurate determination of the contribution of ozone precursors (nitrogen oxides and volatile organic compounds) to Global Climate Change (GCC) (CARB 2004).

Aerosols are suspensions of particulate matter in a gas emitted into the air through burning biomass (plant material) and fossil fuels. Aerosols can warm the atmosphere by absorbing and emitting heat and can cool the atmosphere by reflecting light. Cloud formation can also be affected by aerosols. Sulfate aerosols are emitted when fuel containing sulfur is burned. Black carbon (or soot) is emitted during biomass burning and incomplete combustion of fossil fuels. Particulate matter regulation has been lowering aerosol concentrations in the United States; however, global concentrations are likely increasing (EPA 2006b).

Carbon Dioxide

The natural production and absorption of carbon dioxide (CO_2) is achieved through the terrestrial biosphere and the ocean. However, humankind has contributed to the alteration of the natural carbon cycle by burning coal, oil, natural gas, and wood. Since the industrial revolution began in the mid 1700s, each of these human caused activities has increased in scale and distribution (US EPA 2008b). Carbon dioxide was the first GHG demonstrated to be increasing in atmospheric concentration, with the first conclusive measurements being made in the last half of the twentieth century (US EPA 2008b). Prior to the industrial revolution, concentrations were fairly stable at 280 ppm (EPA 2006b). Today, they are around 370 ppm, an increase of well over 30 percent (EPA 2006b). Left unchecked, the concentration of carbon dioxide in the atmosphere is projected to increase to a minimum of 540 ppm by 2100 as a direct result of anthropogenic sources (IPCC 2001). This will result in an average global temperature rise of at least two degrees Celsius (3.6 ^{O}F) (IPCC 2001).

Table 9
Global Warming Potentials and Atmospheric Lifetimes

Gas	Atmospheric Lifetime (years)	Global Warming Potential Carbon Dioxide Equivalent CO_2E (100 year time horizon)
Carbon Dioxide	50 - 200	1
Methane	12 ± 3	21
Nitrous Oxide	120	310
HFC-23	264	11,700
HFC-134a	14.6	1,300
HFC-152a	1.5	140
PFC: Tetrafluoromethane (CF_4)	50,000	6,500
PFC: Hexafluoroethane (C_2F_6)	10,000	9,200
Sulfur Hexafluoride (SF_6)	3,200	23,900
Source: U.S. Environmental Protection Agency, 2006b.		

Carbon dioxide emissions are directly generated primarily in the form of vehicle exhaust and in the consumption of natural gas for heating. Carbon dioxide emissions are also generated from natural gas combustion and indirectly through the use of electricity. Other indirect sources of carbon dioxide include the use of potable water and generation of wastewater (potable water and wastewater treatment generates greenhouse gases), and the generation of solid waste (EPA 2006b / IPCC 2001).

Methane

Methane (CH_4) is an extremely effective absorber of radiation, though its atmospheric concentration is less than carbon dioxide and its lifetime in the atmosphere is brief (9-15 years), compared to some other GHGs such as carbon dioxide, nitrous oxide, and CFCs (US EPA 2007). Methane has both natural and anthropogenic (human) sources (US EPA 2007). It is released as part of the biological processes in low oxygen environments, such as in swamplands or in rice production (at the roots of the plants). Over the last 50 years, human activities such as growing rice, raising cattle, using natural gas and mining coal have added to the atmospheric concentration of methane (EPA 2006b).

Nitrous Oxide

Concentrations of nitrous oxide (N_2O) also began to rise at the beginning of the industrial revolution. Microbial processes in soil and water, including those reactions that occur in fertilizer containing nitrogen, produce nitrous oxide. The use of fertilizers has increased over the last century. Global concentration for

nitrous oxide in 1998 was 314 ppb; and in addition to agricultural sources for the gas, some industrial processes (fossil fuel-fired power plants, nylon production, nitric acid production, and vehicle emissions) also contribute to its atmospheric load (EPA 2006b).

Chlorofluorocarbons

Chlorofluorocarbons (CFCs) have no natural source but were entirely synthesized for uses as refrigerants, aerosol propellants, and cleaning solvents. Their creation was in 1928, and since then concentrations of CFCs in the atmosphere have been rising (Alexander 1999). Due to the discovery that they are able to destroy stratospheric ozone, a global effort to halt their production was undertaken and was extremely successful, so much so that levels of the major CFCs are now static or declining. However, their long atmospheric lifetimes mean that some of the CFCs will remain in the atmosphere for over 100 years. Since they are also a GHG, along with such other long-lived synthesized gases as CF_4 (carbontatrafuoride) and SF_6 (sulfurhexafluoride), they are of concern. Another set of synthesized compounds called HFCs (hydrofluorcarbons) are also considered GHGs, though they are less stable in the atmosphere and therefore have a shorter lifetime and less of an impact (EPA 2006b). CFCs, CF_4, SF_6 and HFCs have been banned and are no longer available on the market.

5.2 SIGNIFICANCE OF DETERMINATION CRITERIA

This GCC analysis is based on several state agency guidance documents including the June 2008 Governor's Office of Planning and Research (OPR) Technical Advisory on CEQA and Climate Change (OPR 2008), and the State Attorney General's Memorandum outlining what is required of Lead Agencies in Analysis of Global Warming in CEQA Documents (AG 2008). Both of these documents state that although there are no state-wide thresholds at this time, each lead agency is responsible for analyzing and quantifying GHG emissions for projects under their jurisdiction, prescribing all feasible mitigation measures to improve project efficiency and reduce GHG emissions, and making a significance determination based upon the Project's ability to reduce emissions.

This Project will not generate enough GHG emissions to influence global climate change on its own. The Project participates in this potential impact by its incremental contribution combined with the cumulative increase of all other sources of GHGs. The State CEQA Guidelines suggest, from an "air quality" perspective, that a project would normally be judged to produce a significant or potentially significant effect on the environment if the project were to *"Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standards."*

In order to determine whether or not a project would cause a significant effect on the environment, the impact of the project must be determined by examining the types and levels of GHG emissions generated. To date, no federal, state, or Project area local agencies have developed thresholds against

which a project can be evaluated to assist lead agencies in determining whether or not the project is significant.

Under AB 32, CARB published its Final Expanded List of Early Action Measures to Reduce Greenhouse Gas Emissions in California (CARB 2007) which are needed to achieve the reduction goals of AB 32. These reduction goals are derived from the United Nations Intergovernmental Panel on Climate Change (IPCC: CCAT 2007) The IPCC was formed to assess "the scientific, technical and socio-economic information relevant to understanding the scientific basis of risk of human-induced climate change, its potential impacts, and options for adaptation and mitigation" (IPCC 2004). The IPCC climate stabilization models predict that a 400 to 450 carbon dioxide equivalent concentration is needed to stabilize mean global warming at an approximately 2° Celsius rise from current global mean temperature (IPCC 2001). The GHG emission reduction targets in AB 32 are needed to achieve the 400 to 450 carbon dioxide equivalent concentration and stabilize global climate change.

The California Air Resources Control Board published its Draft Scoping Plan to Mitigate Climate Change in California (CARB 2008), which describes recommendations to reduce GHG emissions. The measures will become part of California's strategy for achieving GHG reductions under AB 32. One of the sources for the potential measures includes the Climate Action Team (CAT) Report. Three new regulations are proposed to meet the definition of "discrete early action greenhouse gas reduction measures," which include the following: a low carbon fuel standard; reduction of HFC-134a emissions from non-professional servicing of motor vehicle air conditioning systems; and improved landfill methane capture (CARB 2008). CARB estimates that by 2020, the reductions from those three measures would be approximately 13-26 million metric tons of carbon dioxide equivalent.

5.3 GHG BASELINE EMISSIONS

For the purposes of GHG emissions there are two baseline emission scenarios. The 1995 GHG emissions presented in the impact section below represents the "permitted baseline", as discussed above in Section 3.2.1, Shell records from 1995 indicate that 363 vessels called on the wharf in 1995 without exceeding their overall emissions cap.

The 2007 GHG emission calculations presented below represent the "CEQA baseline" as defined by CEQA.Guideline 15125(a) which states "An EIR must include a description of the physical environmental conditions in the vicinity of the project, as they exist at the time the notice of preparation is published, or if no notice of preparation is published, at the time environmental analysis is commenced, from both a local and regional perspective. This environmental setting will normally constitute the baseline physical conditions by which a lead agency determines whether an impact is significant."

Although the notice of preparation for this EIR was circulated in 2004, reliable data from 2004 is not available. Alternatively, data from the year the GHG emission analysis commenced was utilized (2007). The 2007 data represents another "CEQA" baseline scenario.

5.4 EMISSIONS INVENTORY

An emissions inventory was calculated for the existing terminal activities (2007) based upon the levels of activities provided in the Shore Terminal Annual Emissions Inventory of criteria pollutants. These activities would generate quantifiable amounts of carbon dioxide, methane, and nitrous oxide. Other recognized GHG emissions are refrigerants that will not be emitted as a result of Shell Martinez Marine Terminal operations. The inventory was calculated using AP-42 emission factors, emission factors found in the "Analysis of Commercial Marine Vessels Emissions and Fuel Consumption Data (EPA420-R-00-002, February 2002)" published by the EPA, and the California Climate Action Registry General Reporting Protocol, version 3 (April 2008). These emissions were calculated based upon approximately 196 ocean-going vessels per year, transporting approximately 21,321,000 barrels of crude oil and/or Refinery product. Table 10 summarizes the estimated emissions inventory from current Shell Martinez Marine Terminal activities.

Table 10
Inventory Summary of Existing Terminal Greenhouse Gases (2007)

Source	CO_2 Metric Tons/yr	CH_4 Metric Tons/yr	N_2O Metric Tons/yr	CO_2E Metric Tons/yr
Ballast Emissions	0	0	0	0
Vapor Control Equipment	0	0	0	0
Fugitive Emissions	0	1	0	22
Tank Standing Losses	0	18	0	374
Tank Withdrawal Losses	0	20	0	421
Cargo Loading Emissions	0	5	0	95
Tanker Pumping Emissions	356	0	0	361
Tanker Transit Emissions	1,172	1	0	1,188
Tanker Hoteling Emissions	112	0	0	113
Tug Combustion Emissions	1,036	1	0	1,038
Total Emissions	2,676	46	0	**3,612**

Note: Totals are rounded.

As shown in Table 10, the primary sources of emissions are from the tanker transit emissions and tug combustion emissions at 1,188 and 1,038 metric tons per year respectively.

Table 11 below summarizes predicted emissions resulting from the continuation of the lease with an increase of activities of up to 330 vessels per year, transporting approximately 36,000,000 barrels of crude oil and/or Refinery product. This proposed increase in activity is considered the “end use”. The anticipated increase up to 330 vessels is allowed under the current lease.

Table 11
Inventory Summary of Predicted Future Greenhouse Gas Emissions of Lease Period

Source	CO_2 Metric Tons/yr	CH_4 Metric Tons/yr	N_2O Metric Tons/yr	CO_2E Metric Tons/yr
Ballast Emissions	0	0	0	0
Vapor Control Equipment	0	0	0	0
Fugitive Emissions	0	2	0	37
Tank Standing Losses	0	30	0	630
Tank Withdrawal Losses	0	34	0	709
Cargo Loading Emissions	0	8	0	160
Tanker Pumping Emissions	600	0	0	608

Tanker Transit Emissions	1,973	1	0.00	2,001
Tanker Hoteling Emissions	188	0	0.00	191
Tug Combustion Emissions	1,744	1	0.00	1,768
Total Emissions	**4,505**	**76**	**0.00**	**6,104**

Note: Totals are rounded.

5.5 IMPACT ANALYSIS

An individual project will not generate enough GHG emissions to influence global climate change (AEP 2007). The Project participates in this potential impact by its incremental contribution combined with the cumulative increase of all other sources of GHGs, which when taken together form global climate change impacts. The following discussion reviews each of the GHGs and the Project's potential generation of these gases.

Carbon Dioxide

The Project's main contribution to GHGs is carbon dioxide. The Project will generate emissions of carbon dioxide primarily in the form of exhaust emissions from ocean-going vessels and tug boats. The carbon dioxide emissions are shown in Table 12.

Table 12
Carbon Dioxide Emissions

Emission Source	Carbon Dioxide Emissions (metric tons per year)	Global Warming Potential (GWP) (metric tons per year)
Terminal Emissions (1995)	4,955	4,955
Terminal Emissions (2007)	2,675	2,675
Terminal Emissions (Proposed Lease)	4,504	4,504
Project Comparison to 1995 Emissions	-451	-451
Project Comparison to 2007 Baseline	1,829	1,829

Note: Totals are rounded.

Methane

The Project will generate vapor emissions of methane gas from non-loading venting, cargo-loading venting, and fugitive emissions from flanges and pumps. Vapor emissions of methane were estimated using EPA emission factors shown in Annex F, Methodology for Estimating Methane Emissions from Petroleum Systems (EPA 2000b). Methane emissions will also be generated from ocean-going vessels and tug boats during terminal activities. These emissions were calculated using EPA emission factors found in the Analysis of Commercial Marine Vessels Emissions and Fuel Consumption Data (EPA 2000) and AP-42 emission factors. The emissions are shown in Table 13.

Table 13
Methane Emissions

Emission Source	Methane Emissions (metric tons per year)	Global Warming Potential (metric tons per year)
Terminal Emissions (1995)	82	1,729
Terminal Emissions (2007)	45	949
Terminal Emissions (Proposed Lease)	76	1,597
Project Comparison to 1995 Emissions	-6	-132
Project Comparison to 2007 Baseline	31	648

Note: Totals are rounded.

Nitrous Oxide

The Project generates small amounts of nitrous oxide associated with exhaust emissions of ocean-going vessels and tug boats. Nitrous oxide was estimated using EPA emission factors for marine vessels (EPA 2000). The emissions are presented in Table 14.

Table 14
Nitrous Oxide Emissions

Emission Source	Nitrous Oxide Emissions (metric tons per year)	Global Warming Potential (GWP) (metric tons per year)
Terminal Emissions (1995)	0.0108	3
Terminal Emissions (2007)	0.0059	2
Terminal Emissions (Proposed Lease)	0.0099	3
Project Comparison to 1995 Emissions	0.0009	0
Project Comparison to 2007 Baseline	-0.0049	1

Note: Totals are rounded.

Summary

In summary, the primary GHG generated by the Project would be carbon dioxide. Emissions of methane and nitrous oxide are small in comparison to carbon dioxide. However, due to the global warming potential of methane and nitrous oxide, these greenhouse gases also contribute to the total global warming potential of Project-generated greenhouse gases. Table 15 summarizes the Global Warming Potential of GHG emissions generated by the Project.

Table 15
Global Warming Potential

Emission Sources	Global Warming Potential (GWP) (metric tons per year)
Terminal Emissions (1995)	6,687
Terminal Emissions (2007)	3,626
Terminal Emissions (Proposed Lease)	6,104
Project Comparison to 1995 Emissions	-583
Project Comparison to 2007 Baseline	2,478

Historical total GHG baseline emissions associated with the Shell Terminal operations varied from 3,626 (2007) to 6,687 (1995). Average total emissions cannot be calculated due to lack of consistent data. Therefore, the GHG emissions from the project vary from 3,626 to 6,687 tons per year, or from below 1995 baseline or 2,478 tons per year above the 2007 baseline.

Potential Greenhouse Gas Reduction Strategies as Mitigation

In 2008, the California Air Resources Board (CARB) implemented regulations to reduce oxides of nitrogen (NOx) and diesel particulate matter (PM) emitted by ocean going vessels at berth in California ports (Section 2299.3, Title 13, Chapter 5.1, California Code of Regulations) and is known as Operational Hour Limits, Reduced Onboard Power Generation, and Other Requirements for Auxiliary Diesel Engines Operated on Ocean-Going Vessels At-Berth in a California Port. Although these regulations apply only to passenger, container and refrigerated vessels, some of the reduction measures required by these regulations may also be applied to reduce Project GHG emissions.

Reduction of Power Generation. Project GHG emissions can be reduced with mandatory reductions of onboard power generation or with provision of a equivalent emissions reduction. Power generation emission requirements could vary depending on the year of compliance, 2014 (50%), 2017 (70%) and 2020 (80%) as outlined in Section 2299.3, Title 13, Chapter 5.1, California Code of Regulations.

Use of Shore Power. Vessels equipped to receive shore power that visit terminals with a berth equipped to provide compatible shore power shall utilize the shore power during every visit to that berth unless the berth is already occupied with a vessel receiving shore power.

Alternative control technologies. Alternative control technologies can be used to reduce emissions of the vessel fleets to reduce NOx and PM emissions from the fleet's auxiliary engines when fleet vessels are docked at the berth.

Require submittal of Emission Reduction Control Plan. An Emission Reduction Control Plan that discusses how the terminal will accommodate vessels subject to these requirements can be required.

Analysis of the emissions inventories for terminal operations reveals three main potential strategies to reduce greenhouse gas emissions generated by the Shell Martinez Marine Terminal activities. These include; lower carbon fuel such as biodiesel to reduce overall tanker and tug boat emissions; improved vapor control equipment to further reduce vaporous methane emissions; and cold ironing to reduce emissions associated with shipboard auxiliary power used for pumping, hoteling, and other necessary power needs of the ship.

Low Carbon Fuel for ships

Biodiesel is a non-petroleum-based diesel fuel consisting of short chain alkyl (methyl or ethyl) esters, made by transesterification of vegetable oil or animal fat (tallow), which can be used (alone, or blended with conventional petrodiesel) in unmodified diesel-engines including ships and tugs. An often mentioned incentive for using biodiesel is its capacity to lower GHG emissions compared to those of fossil fuels. Whether this is true or not depends on many factors. Calculating the carbon intensity of biofuels is a complex and inexact process that is highly dependent on the assumptions made in the calculation. For this reason, the reduction of GHG emissions associated with biodiesel is considered speculative at this time and not recommended as a mitigation measure.

Improved Vapor Recovery System

The Shell Martinez Marine Terminal VCS, installed in 1991, complies with the U.S. Coast Guard (USCG) regulations 33 CFR 154 for VCS operations. The system also complies with BAAQMD Regulation 8-44 (Organic Compounds, Marine Vessel Loading Terminals), which limits hydrocarbon emissions to the atmosphere from marine vessels being loaded under certain conditions (e.g., loading with high vapor pressure products). The VCS also meets the CSLC Structural Requirements for Vapor Control Systems at Marine Terminals (CCR Title 2, Division 3, Chapter 1, Article 5.4). Additional improvements in VCSs are being contemplated, but are not available. For this reason, additional reductions in GHG emissions associated with improved vapor recovery systems is not technologically feasible at this time.

Lower Emissions Vessel Engines

In July 2008, CARB adopted a new regulation that will require the use of low-sulfur diesel fuels for all ocean-going vessels that come within 24 nautical miles of the California Coast. It is estimated that retrofitting existing engines or purchasing vessels with low-sulfur emission engines may reduce emissions up to 60 percent with respect to diesel exhaust from ocean-going vessels (CARB 2008b). Although retrofitting existing vessels or introducing new vessels with lower emission engines would reduce emissions, the CSLC does not own or have jurisdiction over international vessels, and therefore can not implement this measure on the large ocean-going vessels.

Cold Ironing

Cold ironing is the process of providing shore-side electrical power to a ship at berth while its main and auxiliary engines are turned off. Cold ironing permits emergency equipment, refrigeration, cooling, heating, lighting, pumps, etc. to receive continuous electrical power while the ship loads or unloads its cargo. A ship can cold iron by simply connecting to a shore-side power source. Cold ironing has the co-benefit of mitigating air pollution, including harmful diesel particulate matter (DPM) emissions (listed as Toxic Air Contaminant by the CARB) from diesel engines. Currently, the berths at the Shell Martinez Marine Terminal do not have power supplies capable of cold ironing vessels. Cold Ironing has the potential to reduce overall terminal GHG emissions by approximately 13 percent.

A draft report was completed by the CARB in December of 2007 regarding cold ironing (Evaluation of Cold-Ironing Ocean Going Vessels at California Ports). The report indicated that providing shore power to tanker vessels may not be a cost-effective way to reduce diesel emissions. The CARB determined that cold ironing is most cost-effective for terminals that receive many ships that visit frequently, have long berthing times, and have significant berthing times. The classes of ships that best met these criteria were passenger, container and refrigerated cargo vessels. It was determined that more study would be required to determine cost-effective measures to reduce emission for oil and oil product tankers. For this reason the regulation was not applied to other categories of ships. The development of rules for all other categories of ships not included in section 2299.3, Title 13, Chapter 5.1, California Code of Regulations (CCR) will take place in 2009. The CARB began focusing their efforts on oil and oil product tankers in January, 2009. It is unknown if the regulatory requirements will be similar to those promulgated for passenger, container and refrigerated vessels.

Mitigation Measures:

Mitigation Measure GHG-1:

No later than one-year after approval of the issuance of a new lease for the Shell Martinez Marine Terminal and again on or before the five-year anniversary of said approval, Shell shall memorialize their method of compliance with CCR Section 2299.3, Title 13, Chapter 5.1 in a written report to Commission staff including the status of all plans, actions, decisions, or studies by the California Air Resources Board and/or the Bay Area Air Quality Management District with respect to tecnnologies that will reduce the emission of greenhouse gases from oil tanker vessels operating at the Shell Martinez Marine Terminal.

SECTION 6.0 – EVALUATION OF SIGNIFICANCE

6.1 EVALUATION

Impact AQ-1: Existing Operations' Consistency with the Applicable Air Quality Plans

Measured and calculated criteria pollutant emissions are below existing yearly BAAQMD permitted levels. Continued operation of the Shell Martinez Marine Terminal at current throughput levels would not result in significant air quality emissions impacts. Since the facility is already operational, worker commute emissions are already part of ambient conditions, thus non-permitted emissions impacts are adverse, but not significant.

Permitted emissions include those emissions that are considered a part of the ambient air quality in the local and regional area and have been included in the Bay Area regional air quality planning process. The Shell Martinez Marine Terminal emissions associated with operation of the vapor recovery/thermal oxidizer, loading operations, and fugitive sources (tanks, pumps, valves, and flanges) are covered under permits to operate pursuant to the requirements of BAAQMD Regulation 2 (BAAQMD 2007). Tanker maneuvering and hoteling, tanker pumping, tugboats, etc., are calculated, as described in the Title V Permit for the Shell Martinez Marine Terminal's facility and included as part of the permitted emissions of the entire facility (wharf and upland tankage) as specified under the REFEMS, but are not individually permitted by the BAAQMD.

Emissions are influenced by a number of variables, most significantly product throughput and mode of transport. The Shell facility uses continuous emission monitors and source sampling to provide computerized monthly criteria pollutant emission inventory to the BAAQMD. The limits set by the BAAQMD were determined to be sufficient to account for these emissions. Other emissions include indirect emission sources, such as tug combustion emissions, tanker hoteling, tanker transit, and tanker pumping. These indirect emissions are not permitted; however, they are calculated per the permit conditions specified in the Shell Martinez Marine Terminal's Title V Permit and are considered as part of the overall emissions of the facility.

Recent years have seen a decline in Shell Martinez Marine Terminal use. Between the years 1999 and 2005, an average of 196 vessels called on the Shell Martinez Marine Terminal. Table AQ-1, demonstrates that the emissions associated with the operation of the Shell Martinez Marine Terminal are well within the regulatory limitations of the existing permit on file with the BAAQMD. Because Shell operates the Refinery and Shell Martinez Marine Terminal well within REFEM Cap limitations, the continued operation of the Project does not conflict with or obstruct implementation of the applicable air quality plans, and the impact is adverse but less than significant.

Table 16
Emissions Associated With Terminal Operation (Years 1995, Existing, & Proposed Lease)

Source	POC Tons/yr	NO_X Tons/yr	SO_X Tons/yr	Exhaust PM_{10} Tons/yr	Fugitive PM_{10} Tons/yr	Total PM_{10} Tons/yr	Total $PM_{2.5}$ Tons/yr
Terminal Emissions (1995)	37.23	149.28	141.55	13.89	0.00	13.89	12.78
Terminal Emissions (2007)	20.10	80.60	76.43	7.50	0.00	7.50	6.90
Terminal Emissions (proposed Lease)	33.84	135.71	128.68	12.63	0.00	12.63	11.62
REFEMS Terminal Limit	86.20	176.40	288.40	-	-	15.50	-
Exceed Limit?	No	No	No	-	-	No	-

Shell estimates that over the life of the lease, Shell Martinez Marine Terminal operations could expand from present levels to as many as 330 vessels per year. This would represent an increase of about 68 percent over the current vessel traffic (i.e., 196 vessels per year). Assuming that the emissions generated from wharf operations are directly proportional to the number of vessels, Table AQ-1 compares future emissions with existing emissions as well as those limitations under the REFEMS Cap used in the preparation of baseline emissions. Note that even at 330 vessels per year, Shell Martinez Marine Terminal operations would not exceed the limitations of the REFEMS Cap and the impact is adverse, but less than significant.

AQ-1: No mitigation is required.

AQ-2: Project Potential to Violate or Add to a Violation of an Air Quality Standard

Site Operations:

Over the life of the lease, the anticipated vessel increase from 196 to 330 vessels per year would not exceed the limitations of the REFEMS Cap, and the impact is adverse, but less than significant.

Shell estimates that over the life of the lease, Shell Martinez Marine Terminal operations could expand from present levels to as many as 330 vessels per year. This would represent an increase of about 68 percent over the current vessel traffic (i.e., 196 vessels per year). Assuming that the emissions generated from wharf operations are directly proportional to the number of vessels, Table AQ-1 compares future emissions with existing emissions as well as those limitations under the REFEMS Cap used in the preparation of baseline emissions. Note that even at 330 vessels per year, Shell Martinez Marine Terminal operations would not exceed the limitations of the REFEMS Cap; and the impact is adverse, but less than significant.

While the number of vessels is estimated to increase by approximately 68 percent over current levels, at full projected use (i.e., 330 vessels per year), the number of vessels that call on the Shell Martinez Marine Terminal would still be reduced from the 363 vessels used in the generation of baseline conditions. As such, the existing number of plant personnel could handle the projected volume of vessels, and any increase in the number of on-road trips associated with the augmented operation of the Shell Martinez Marine Terminal would be minimal. Impacts are adverse, but less than significant.

Maintenance (Dredging):

Dredging activities represent short-term emissions associated with maintaining channel and berthing depth and are not subject to the day-to-day operations' criteria as long as all PM_{10} suppression methods included in the BAAQMD CEQA Guidelines are administered. No fugitive dust emissions are raised during the dredging of wet sediment, and none of the measures address PM_{10} associated with exhaust. As such, construction emissions associated with short-term dredging are adverse, but less than significant.

No major construction is proposed as part of the 30-year lease. Upgrades, maintenance, and repair expected as part of the 30-year lease renewal are considered minor in nature and are included in the baseline activities. Shell is required to notify the CSLC of major repairs, which CSLC staff review for environmental applicability, among other criteria. Over the lease period, it is anticipated that the area in and around Berths #3 and #4 would be dredged.

Dredging around Berths #3 and #4 would create short-term emissions. Dredging would be of short duration (probably less than one week), and would not add to the long-term emissions associated with the day-to-day operation of the wharf. Dredged sediments would be loaded on a barge or scow for subsequent delivery. This barge would be pulled using a tugboat. A tug is also assumed to be used in dredge placement and to remove spoils from the area.

In compliance with construction noise requirements, the dredge and its related equipment is assumed to operate 14 hours per day between 7:00 a.m. and 10:00 p.m. This would allow 1-hour down-time for equipment maintenance and worker breaks.

Emissions for the tug were calculated using AP-42 (USEPA, 1985). Because emissions for marine vessels vary widely and AP-42 does not present emissions for either SO_X or PM_{10} for marine vessels, emissions factors for diesel industrial engines were utilized for these two pollutant species. These emissions are provided in gm/hp/hr as well as lb/103 gallons and are roughly equivalent to emission factors provided for the higher polluting heavy construction equipment.

As many as 10 workers are allocated to operate the dredge and tug. The workers would produce emissions commuting to and from the site. As such, the 10 workers are estimated to generate approximately 236 miles per day. A crew boat would be used to shuttle workers to and from the dredge. However, the boat could be stationed at the Shell Martinez Marine Terminal or neighboring Martinez Marina, and any emissions associated with the movement of personnel between the shore and the equipment would be inconsequential.

Table AQ-2 outlines the projected emissions associated with the use of a clamshell dredge and the tugboat. Because these represent short-term emissions associated with the "construction" of a deeper channel, they are not subject to the day-to-day operations' criteria so long as all PM_{10} suppression methods included in the BAAQMD *Guidelines* are administered. Note that all of the measures included in the *Guidelines* focus on the reduction of PM_{10} associated with fugitive dust. No fugitive dust emissions are raised during the dredging of wet sediment, and none of the measures address PM_{10} associated with exhaust. As such, construction emissions associated with short-term dredging are adverse, but less than significant.

Table 17
Daily Emissions For Vessels and Equipment Associated With Dredging Operations (lb/day)

Source	CO lb/day	POC lb/day	NO_X lb/day	SO_X lb/day	Exhaust PM_{10} lb/day	Fugitive PM_{10} lb/day	Total PM_{10} lb/day	Total $PM_{2.5}$ lb/day
Permitted Sources:								
Dredge	80.85	10.39	352.80	23.81	10.29	14.71	10.29	9.47
Generator	46.76	17.61	217.00	14.35	15.40	0.00	15.40	14.17
Total Permitted Sources:	**127.61**	**27.99**	**569.80**	**38.16**	**25.69**	**14.71**	**25.69**	**23.63**
Unpermitted Sources:								
Tugboat	87.71	22.48	361.25	24.38	10.29	0.00	10.29	9.46
Worker Commutes	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Un-Permitted Sources	**87.71**	**22.48**	**361.25**	**24.38**	**10.29**	**0.00**	**10.29**	**9.46**
Total Daily Emissions[1]	**215.32**	**50.47**	**931.05**	**62.55**	**35.98**	**14.71**	**35.98**	**33.10**

1 Totals may be off due to rounding.

AQ-2: No Mitigation is required.

AQ-3: Project Potential to Result in a Cumulatively Considerable Increase in Criteria Pollutants

Cumulative projects in the region contribute to cumulative emissions in the region. The Project is permitted for criteria pollutants through the BAAQMD and Project emissions are included in the applicable Clean Air Plan and Ozone Plan.

The Project and other projects in the region will continue to generate air emissions over the life of the lease and thereby contribute to cumulative emissions within the region. At the level of current operations, Shell Martinez Marine Terminal emissions are within the existing baseline conditions and will not contribute additional emissions to the cumulative impact. The potential future increase in operations could result in potentially significant adverse impacts that would be reduced to a level of adverse, but less than significant through the use of improved technology and BAAQMD requirements.

AQ-3: No mitigation is required.

AQ-4: **Project Potential to result in a Cumulatively Considerable Increase in Greenhouse Gas Emissions**

Greenhouse Gas Analysis Summary

An individual project cannot generate enough GHG emissions to influence global climate change. The Project participates in this potential impact by its incremental contribution combined with the cumulative increase of all other sources of GHGs, which when taken together form global climate change impacts. The following discussion reviews each of the GHGs and the Project's potential generation of these gases.

The Project's main contribution to GHGs is carbon dioxide. The Project will generate emissions of carbon dioxide primarily in the form of exhaust emissions from ocean-going vessels and tug boats.

The Project will generate vapor emissions of methane gas from non-loading venting, cargo-loading venting, and fugitive emissions from flanges and pumps. Vapor emissions of methane were estimated using EPA emission factors shown in Annex F, Methodology for Estimating Methane Emissions from Petroleum Systems (EPA 2000b). Methane emissions will also be generated from ocean-going vessels and tug boats during terminal activities. These emissions were calculated using EPA emission factors found in the Analysis of Commercial Marine Vessels Emissions and Fuel Consumption Data (EPA 2000) and AP-42 emission factors.

The Project generates small amounts of nitrous oxide associated with exhaust emissions of ocean going vessels and tugboats. Nitrous oxide was estimated using EPA emission factors for marine vessels (EPA 2000).

In summary, the primary GHG generated by the Project would be carbon dioxide. Emissions of methane and nitrous oxide are small in comparison to carbon dioxide. However, due to the global warming potential of methane and nitrous oxide, these greenhouse gases also contribute to the total global warming potential of Project-generated greenhouse gases. Table AQ-3 summarizes the Global Warming Potential of GHG emissions generated by the Project.

GHG emissions thresholds to be used during the CEQA evaluations have not been established at this time by the CSLC, CARB, OPR, an Executive Order, the local county, nor by legislation. However, a qualitative discussion of potential significance will be provided here as part of this analysis.

Table 18
Unmitigated Global Warming

Emission Sources	Global Warming Potential (GWP) (metric tons per year)			
	CO_2	CH_4[1]	N_2O[2]	Combined CO_2E
Terminal Emissions (1995)	4,955	1,729	3	6,687
Terminal Emissions (2007)[3]	2,675	949	2	3,626
Terminal Emissions (Proposed Lease)	4,504	1,579	3	6,104
Project Comparison to 1995 Emissions	-451	-132	0	-583
Project Comparison to 2007 Baseline	1,829	648	1	2,478

1. Tons per year of CH_4 are multiplied by 21 to obtain the CO_2E value for methane;
2. Tons per year of N_2O are multiplied by 310 to obtain the CO_2E value for nitrous oxide.
3. Complete data from 2004 (the date of the NOP) are not available.

In 2008, the California Air Resources Board (CARB) implemented regulations to reduce oxides of nitrogen (NOx) and diesel particulate matter (PM) emitted by ocean going vessels at berth in California ports. This regulation is found in section 2299.3, Title 13, Chapter 5.1, California Code of Regulations (CCR) and is known as Operational Hour Limits, Reduced Onboard Power Generation, and Other Requirements for Auxiliary Diesel Engines Operated on Ocean-Going Vessels At-Berth in a California Port. These regulations apply only to passenger, container and refrigerated vessels.

AQ-4: The Project requires the following mitigation based on existing and future emissions of greenhouse gases.

Mitigation Measure GHG-1: No later than one-year after approval of the issuance of a new lease for the Shell Martinez Marine Terminal and again on or before the five-year anniversary of said approval, Shell shall memorialize their method of compliance with CCR Section 2299.3, Title 13, Chapter 5.1 in a written report to Commission staff. This will include the status of all plans, actions, decisions, or studies by the California Air Resources Board and/or the Bay Area Air Quality Management District with respect to cold ironing or other comparable technology (including the possibility of installing onshore cold ironing or other comparable infrastructure), relating to oil tanker vessels operating at the Shell Martinez Marine Terminal.

AQ-5: Project Potential to Expose Sensitive Receptors to Substantial Pollutant Concentrations

The Shell Martinez Marine Terminal is in compliance with the BAAQMD permitting for hazardous and toxic pollutants. Impacts are adverse, but less than significant.

Substantial pollutant concentrations are typically associated with fixed sources, such as a refinery stack, or as carbon monoxide hot spots in areas where vehicles queue, such as at an intersection. Because the wharf and its operations have been permitted through the BAAQMD, Shell has satisfied the requirements related to both toxic air contaminants and accidental release of acutely hazardous air emissions. Necessary hazardous and toxic pollutant modeling, as well as necessary contingency measures, have been submitted as part of the permitting process and are on file with the BAAQMD. The BAAQMD would not issue appropriate permits without adequate documentation and mitigation. Impacts are less than significant.

Furthermore, because operations at the Shell Martinez Marine Terminal require only a minimum of workers, and no substantial increase in the number of workers would occur even with future augmented operations, the Project would not result in the addition of vehicles to the road that would result in the formation of carbon monoxide hot spots. The impact is less than significant.

AQ-5: No mitigation required.

AQ-6: Project Potential to Create Objectionable Odors

No sensitive receptors are located in the immediate area, and the Shell Martinez Marine Terminal does not emit odors that are/have been reported in the local area. Impacts are adverse, but less than significant.

The primary source of odors from the Shell Martinez Marine Terminal would be fugitive POC emissions escaping to the atmosphere during loading and unloading operations. These odors are typically removed in the vapor recovery system, which captures and destroys the POC in a thermal oxidizer. POCs are broken down to largely odorless compounds of water and carbon dioxide. No increase in odors would be expected due to the continued operation of the Shell Martinez Marine Terminal under the conditions of the proposed 30-year lease. Therefore, the impact is less than significant.

AQ-6: No mitigation is required.

AQ-7: Impacts of Alternatives

No Project Alternative

Decommissioning of the Shell Martinez Marine Terminal would be subject to short-term construction air quality impacts that would be adverse, but less than significant. With No Project, there would be no operations or emissions at the Shell Martinez Marine Terminal; however, operations would be transferred to other Bay Area marine terminals; Therefore, impacts would be similar to the Project

Under the No Project Alternative, Shell's lease would not be renewed, and the existing Shell Martinez Marine Terminal would be subsequently decommissioned with its components abandoned in place, removed, or a combination thereof.

For the purposes of this Analysis, it has been assumed that the No Project Alternative would result in a decommissioning schedule that would consider implementation of one of the described transportation alternatives. Any future crude oil or product transportation alternative would be the subject of a subsequent application to the CSLC and other agencies having jurisdiction, depending on the proposed alternative.

Decommissioning would be assumed to be accomplished primarily via the water, with materials, other than those that can be used at the Shell Refinery, taken away via barge. The activity would require heavy equipment to be used in the demolition of the wharf and related structures. However, this would effectively curtail any ships from berthing at the terminal, and the reduction in emissions associated with terminating terminal operations would compensate for any emissions generated during demolition. Furthermore, demolition of the wharf would be construed as construction, and, as noted for dredging operations, construction is considered as adverse, but less than significant so long as all feasible dust implementation measures presented in the BAAQMD *Guidelines* are adhered to. Impacts would be adverse, but less than significant.

After decommissioning, the operations associated with the Shell Martinez Marine Terminal would cease, resulting in a slight beneficial impact. However, for the air basin, operations would be transferred to other Bay Area marine terminals. These terminals would be subject to review by BAAQMD to determine whether the increase in operations would be in compliance with permitting.

Full Throughput Alternative

One or more existing terminals would be used for crude and product transfers for the Shell Refinery. New pipelines would be required to connect to the Shell Refinery. Impacts would be adverse, but less than significant.

Existing terminals would pose no air quality impacts so long as they operate within BAAQMD permit conditions. Any expansion would require permitting under the requirements and guidance of the BAAQMD. Emissions associated with the existing Shell Martinez Marine Terminal could be banked and applied to the terminal expansion. If necessary, terminal owners/operators could reduce emissions at their inland facilities or purchase emissions offset credits such that no new emissions would be associated with any expansion, and any impacts would be adverse, but less than significant.

Construction of new pipelines would be subject to requirements for dust suppression outlined in the BAAQMD *Guidelines* requiring dust suppression in accordance with the projected level of activity. Adherence to these requirements would ensure that any impacts remain less than significant.

A slight beneficial impact would occur locally, if existing terminals are utilized to replace existing and future operations at the Shell Refinery. However, for the air basin, operations would be transferred to other Bay Area marine terminals. These terminals would be subject to review by BAAQMD to determine whether the increase in operations would be in compliance with permitting. It is likely that any beneficial impacts at this terminal would result in increased impacts at other bay area marine terminals.

AQ-7: No mitigation required.

6.2 MITIGATION SUMMARY

Table 19
Summary of Air Quality Impacts and Mitigation Measures

Impacts	Mitigation Measures
AQ-1: Existing Operations' Consistency with the Applicable Air Quality Plans.	**AQ-1**: No mitigation required.
AQ-2: Project Potential to Violate or Add to a Violation of an Air Quality Standard.	**AQ-2:** No mitigation required.
AQ-3: Project Potential to Result in a Cumulatively Considerable Increase in Criteria Pollutants	**AQ-3:** No mitigation required
AQ-4: Project Potential to Result in a Cumulatively Considerable Increase in Greenhouse Gas Emissions	Mitigation required to reduce GHG emissions. **(Mitigation Measure GHG-1)**
AQ-5: Project Potential to Expose Sensitive Receptors to Substantial Pollutant Concentrations	**AQ-5:** No mitigation required.
AQ-6: Project Potential Create Objectionable Odors	**AQ-6:** No mitigation required.
AQ-7: Impacts of Alternatives	**AQ-7:** No mitigation required.

Required Mitigation for the Project Includes:

Mitigation Measure GHG-1: No later than one-year after approval of the issuance of a new lease for the Shell Martinez Marine Terminal and again on or before the five-year anniversary of said approval, Shell shall memorialize their method of compliance with CCR Section 2299.3, Title 13, Chapter 5.1 in a written report to Commission staff. This will include the status of all plans, actions, decisions, or studies by the California Air Resources Board and/or the Bay Area Air Quality Management District with respect to cold ironing or other comparable technology (including the possibility of installing onshore cold ironing or other comparable infrastructure), relating to oil tanker vessels operating at the Shell Martinez Marine Terminal.

6.3 SIGNIFICANCE CONCLUSION

6.3.1 Less Than Significant

The Project is found to be ***Less than Significant*** for the following impacts (excludes AQ-4):

AQ-1: Existing Operations' Consistency with the Applicable Air Quality Plans

Measured and calculated criteria pollutant emissions are below existing yearly BAAQMD permitted levels. Continued operation of the Shell Martinez Marine Terminal at current throughput levels would not result in significant air quality emissions impacts. Since the facility is already operational, worker commute emissions are already part of ambient conditions, thus non-permitted emissions impacts are not significant.

AQ-2: Project Potential to Violate or Add to a Violation of an Air Quality Standard

Site Operations:

Over the life of the lease, the anticipated vessel increase from 196 to 330 vessels per year would not exceed the limitations of the REFEMS Cap, and the impact is less than significant.

Maintenance (Dredging):

Dredging activities represent short-term emissions associated with maintaining channel and berthing depth (which is part of existing operations) and are not subject to the day-to-day operations' criteria as long as all PM_{10} suppression methods included in the BAAQMD CEQA Guidelines are administered. No fugitive dust emissions are raised during the dredging of wet sediment, and none of the measures address PM_{10} associated with exhaust. As such, construction emissions associated with short-term dredging are less than significant.

AQ-3: Project Potential to Result in a Cumulatively Considerable Increase in Criteria Pollutants.

The Shell Martinez Marine Terminal is in compliance with the BAAQMD permitting for criteria pollutants, and Project generated emissions are included in the applicable Clean Air Plan and Ozone Plan. Impacts are less than significant.

AQ-5: Project Potential to Expose Sensitive Receptors to Substantial Pollutant Concentrations

The Shell Martinez Marine Terminal is in compliance with the BAAQMD permitting for hazardous and toxic pollutants. Impacts are less than significant.

AQ-6: Project Potential to Create Objectionable Odors

No sensitive receptors are located in the immediate area, and the Shell Martinez Marine Terminal does not emit odors that are/have been reported in the local area. Impacts are less than significant.

AQ-7: Impacts of Alternatives

No Project Alternative

Decommissioning of the Shell Martinez Marine Terminal would be subject to short-term construction air quality impacts that would be adverse, but less than significant. With No Project, there would be no operations or emissions at the Shell Martinez Marine Terminal; however, operations would be transferred to other Bay Area marine terminals. Therefore, impacts are similar to the Project.

Full Throughput Alternative

One or more existing terminals would be used for crude and product transfers for the Shell Refinery. New pipelines would be required to connect to the Shell Refinery. Impacts would be less than significant.

SECTION 7.0 – REFERENCES

Encyclopedia of Environmental Science;

1999 David Alexander and Rhodes Whitmore Fairbridge. Published 1999.

Association of Environmental Professionals (AEP):

2007 White Paper: Alternative Approaches to Analyzing Greenhouse Gases and Global Climate Change Impacts in CEQA Documents, June 2007.

Bay Area Air Quality Management District (BAAQMD):

1999 BAAQMD CEQA Guidelines: Assessing the Air Quality Impacts of Projects and Plans, December 1999.

2000 Bay Area 2000 Clean Air Plan (CAP) and Triennial Assessment, Final, Adopted December 20, 2000.

2006 Bay Area 2005 Ozone Strategy, Final, Adopted January 4, 2006.

2006 BAAQMD Rules and Regulations Amended December 5, 2007.

2008 Bay Area Air Quality Monitoring Data (2005, 2006, 2007). 2008.

2008b Ambient Air Quality Standards & Bay Area Attainment Status, http://www.baaqmd.gov/pln/air_quality/ambient_air_quality.htm, May 29, 2008.

California Air Pollution Control Officers Association (CAPCOA):

2008 White Paper: CEQA and Climate Change, January 2008.

California Air Resources Board (CARB):

2004 Technical Support Document for Staff Proposal Regarding Reduction of Greenhouse Gas Emissions from Motor Vehicles Climate Change Overview, July 21, 2004.

2006 EMFAC2007 Computer Model, Version 2.3, November 1, 2006.

2007 State Ambient Air Quality Standards, Amended, 2007.

2007b California Air Resources Board, Proposed Early Actions to Mitigate Climate Change in California http://www.arb.ca.gov/cc/factsheets/support_ccoverview.pdf. April 20, 2007.

2007c California Greenhouse Gas Emissions Levels: 1990-2004 Inventory work. December 2007.

2008 Climate Change Draft Scoping Plan Pursuant to AB 32, June 2008.

2008b California ARB Adopts Low-Sulfur Fuel Rules for Ocean-Going Vessels; US Adopts MARPOL Act, http://www.greencarcongress.com/2008/07/california-arb.html, July 2008.

California Climate Action Registry:

2008 General Reporting Protocol, Version 3, April, 2008.

California Climate Action Team (CAT):

2007 California Climate Action Team's Final Report to the Governor and Legislature, March 2007

California Department of Justice; Attorney General's Office (AG):

2008 Memorandum: California Environmental Quality Act, Addressing Global Warming Impacts at a Local Agency Level, Updated September 26, 2008.

Governor's Office of Planning and Research (OPR):

2008 OPR Technical Advisory on CEQA and Climate Change, June 2008.

Intergovernmental Panel on Climate Change (IPCC):

2001 Climate Change 2001: The Scientific Basis, Contribution of Working Group I to the Third Assessment Report of the Intergovernmental Panel on Climate, http://www.ipcc.ch/pub/reports.htm, 2001.

2004 Sixteen Years of Scientific Assessment in Support of the Climate Convention, http://www.ipcc.ch/about/anniversarybrochure.pdf, December 2004.

U.S. Environmental Protection Agency (EPA)

1985 U.S. Environmental Protection Agency, AP-42, Compilation of Air Pollutant Emission Factors, Fourth Edition, September 1985

1999 The Cost and Benefit of the Clean Air Act: 1990-2010, Appendix D—Human Health Effects of Criteria Pollutants, November 1999.

2000 Analysis of Commercial Marine Vessels Emissions and Fuel Consumption Data, February 2000.

2000b Inventory of U.S. Greenhouse Gas Emissions and Sinks, 1990-1998, April 15, 2000.

2006 National Ambient Air Quality Standards Amended 2006.

2006b High Global Warming Potential (GWP) Gases, http://www.epa.gov/highgwp/scientific.html, December 2006.

2007 U.S. Environmental Protection Agency Information on Climate Change: Greenhouse Gas Emissions: Methane. http://www.epa.gov/methane/. April 2007.

AP-42, Compilation of Air Pollutant and GHG Emission Factors, Fifth Addition. Updated July 2008.

2008b Human Related Sources and Sinks of Carbon Dioxide, http://www.epa.gov/climatechange/emissions/co2_human.html. September 2008.